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utilizing such chemical reactions would thus become available for defense applications.

Exothermic chemical reactions which occur in static and flowing gas mixtures are being investigated for laser sources. Thermal, photochemical and electric-discharge schemes are used to initiate these reactions. Energy transfer, reaction rates and spectroscopic processes are being studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0006, GRADUATE STUDENT RESEARCHERS PROGRAM

J.B. Phillips, Southern Illinois University, Carbondale Campus, School of Science, Dept. of Chemistry, *Carbondale, Illinois* 62901 (NGT 14-018-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

3.0007, EVALUATION OF A NOVEL HYDROCRACKING CATALYST FOR CONVERSION OF SHALE OIL INTO HIGH YIELDS OF JET FUEL

Unknown, Standard Oil Co. of Indiana, Amoco Oil Company, *Box 400, Naperville, Illinois* 60540 (DF464550; F33615-79-C-2095)

To determine how effectively a novel, AMOCO-developed catalyst system converts whole crude shale oil into high quality feedstocks with high yields in the jet fuel boiling range.

Bench scale equipment will be used to evaluate the effectiveness of the new AMOCO-developed catalyst system for hydrocracking whole crude shale oil at varying combinations of temperature pressure and flow rate. Catalyst composition and catalyst support chemical and physical properties will be varied to determine the best configuration for shale oil processing.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

3.0008, GRADUATE STUDENT RESEARCHERS PROGRAM

I. Adler, University of Maryland, College Park Campus, Graduate School, Dept. of Chemistry/Geology, *College Park, Maryland* 20742 (NGT 21-002-807)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

3.0009, STATISTICAL MECHANICAL INVESTIGATIONS OF VARIOUS ASPECTS OF STRUCTURE AND RELAXATION IN FLUIDS

R.J. Silbey, Massachusetts Inst. of Technology, School of Science, Dept. of Chemistry, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (CHE75-03472)

Research in four broad areas will be undertaken: Structure in polar and non-polar dialectric fluids, polymer dynamics, laser light scattering from fluid systems, and fluid surface and interface problems.

The proposed research on polar and non-polar fluids will exploit the mean spherical models in conjuction with thermodynamic perturbation theory to develop a quantitative description of these liquids. In polymer dynamics the development of a new theory based upon the ideas of Debye and Eueche will be continued.

In the laser light scattering area the depolarized light scattering from anisotropic particles in solution will be studied for systems in which coupling between rotational and translational diffusion can not be neglected. The recently observed concentration dependence of the linewidth of light scattered from a macromolecule which is large compared to the wavelength of the scattered light will also be investigated.

Finally, a number of fluid interface problems will be studied. These include the influence of a free surface on transport properties, development of a theory of the dynamic surface tension and determination of the molecular basis of the Relmholtz equation. This work is a continuation of that currently supported by Foundation Grant GP-31930X.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0010, X-RAY CHARACTERIZATION OF ARMY WEAPON SYSTEM MATERIALS

C.P. Gazzara, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0A4771)

To develop advanced methods and techniques for X-ray characterization of the crystal structure of materials used in Army systems. The two major objectives are the development of an accurate residual stress procedure and an analytical technique to speed processing of X-ray diffraction data. This work is in direct support of on-going materials analyses for major aircraft, missile and armament system components.

A method to increase the accuracy of residual stress analysis by X-rays will be explored. Deficiencies within the two point X-ray method will be corrected and a multiple point statistical treatment will be formulated. An automated pole figure device will be modified to accept the offset method. Texture studies of extruded uranium will be conducted and correlated with elastic modulus data as well as increasing the precision of residual stress measurements. Automation of X-ray diffraction procedures will be developed and executed.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0011, IMPROVED FAILURE CRITERIA FOR COMPOSITE LAMINATES

J.M. Slepetz, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0C4687; N/A)

Design of composite structures is commonly based on strength predictions of 'first ply failure' approaches. New failure criteria are needed in multidirectional laminates to allow for such effects as delamination and 'softening' in damaged zones. In addition, results here and elsewhere have shown that Weibull type approaches which allow for size effects in plates with notches and other stress risers are appropriate. The aim of this work unit is to provide experimental results leading to computer models which take these phenomena into account and to develop failure criteria for notched laminates which (a) predict the incipient failure mode, and (b) predict the critical load(s) at failure.

The approach is a combined analytical and experimental study of several material systems and laminate configurations. A 3-D finite element laminate analysis of an undamaged, notched panel subjected to tension or in-plane shear will be under-taken to determine stress conditions leading to initial failure by either of the dominant modes. The failure zone will be represented by a region of high compliance, constructed analytically, to determine stress conditions leading to catastrophic failure. Experiments will be conducted on notched tension and specimens of different configurations to determine the onset and development of the damage zone and to determine the size and growth of the zone with increased loading to failure.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0012, NEW METHOD TO ASSESS FRACTURE TOUGHNESS OF IMPORTANT STRUCTURAL ALLOYS AND NONMETALLIC MATERIALS

N. Tsangarakis, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4740)

The objective of this project is to address methodology that is needed to characterize the resistance to unstable crack growth (fracture toughness) of structural alloys and nonmetallic materials important to the Army but whose meaningful fracture tough-

ness characterization is not possible under currently available testing techniques (ASTM E399). Falling in this category are steels in the medium-high strength range such as important gear and torsion bar steels, and ceramic materials utilized in high-temperature engine application.

To date, linear elastic fracture toughness characterization has, utilizing linear elastic fracture mechanics analysis (LEFM), provided failure criteria for a limited class of materials where small scale has occurred at the crack tip under (mode I), crack loading conditions, the validity of the LEFM analysis is supported experimentally by test procedures outlined under ASTM E-399. However, in those instances where the material is medium strength (torsion bar materials and gear steels) and exhibits elastic-plastic behavior and/or the crack loading falls within the mode II or mode III categories, fracture toughness characterization must be examined by techniques such as the J-integral or the mode II or mode III stress intensity approaches. For relatively brittle non-metallic materials (ceramics, glass), experimental assessment of the fracture toughness in the mode I crack loading will be examined utilizing the notched-ring and short-rod techniques.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0013, RELATIONSHIP OF ABLATIVE MECHANISMS TO FIBER PERFORMANCE AGAINST LASERS

E.M. Healy, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0G4271)

The objective of this effort is to determine the mechanisms of ablation and other breakdown patchways when fibrous polymers and other materials of potential value in individual protection are exposed to infrared CW laser radiation.

Selected polymeric materials will be exposed to controlled laser irradiation at 10.6 microns and other wavelengths of interest. Delineation of breakdown processes will be sought by examination of volatiles condensible materials and residues with and without positive removal of ablative material.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0014, SURFACE MODIFICATION BY ION BEAM INDUCED MIXING

J.W. Mayer, Cornell University, Ithaca Campus, School of Engineering, Dept. of Materials Science & Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (DN075443; N00014-80-C-0479)

The Navy has need for new materials with improved properties for electronics systems and with improved mechanical and chemical properties. Investigations need to be made on the technique of using ion-induced mixing of thin solid films to produce new metastable phases.

Thin films of non-equilibrium mixtures of atoms in an amorphous or crystalline state will be prepared by bombarding substrates covered with thin metal films. The ion-induced mixing of species avoids sputtering problems associated with high dose implantation. Subsequently, thermal (oven), laser, or electron beam annealing will be applied and the characteristics of the new phases observed and characterized. Initially, metals on silicon or germanium will provide the systems of interest. Eventually metal-metal and other semiconductors will become the materials of interest. Properties of particular concern are electrical, mechanical and chemical. Material systems will be chosen which may find applications for electronics, and reduced wear and corrosion. Characterization techniques will include backscattering spectrometry, transmission electron microscopy, and X-ray diffraction.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0015, MATERIALS SUPPORT TECHNOLOGY - SURFACE REACTIONS

J.B. Hudson, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Materials Engineering, *110 8th St., Troy, New York* 12181 (DN223360; N00014-75-C-0730)

Reactions at surfaces are important in many areas of interest to the Navy which include corrosion processes, catalytic processes, and reactions which affect the electrical properties of semiconducting devices. It is the purpose of this research to investigate reactions at surfaces with a view toward improving the properties of Navy material subjected to harsh environments.

Electron probe surface analytical techniques such as Auger spectroscopy and electron stimulated desorption, and also molecular beam relaxation spectroscopy will be used to characterize the nature of surface molecular intermediates and reaction products resulting from chemical reactions on surfaces. The disproportionation of carbon monoxide to form carbon and carbon dioxide, and the uptake of hydrogen to form small organic molecules on nickel surfaces will be studied. The interaction and reaction of nitrogen containing gases such as ammonia and hydrazine with iron surfaces including the effects of surface alloying with metal impurities and sulfur will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0016, TOXICITY EVALUATION AND VALIDATION OF EXPOSURE GUIDELINES FOR USE IN NAVAL OPERATIONAL ENVIRONMENTS

L.J. Jenkins, U.S. Dept. of Defense, Navy, Naval Medical Research Inst., Toxicology Detachment, *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DN877461)

A modern technologically oriented Navy requires the use of a great number of potentially toxic chemicals. To adequately protect personnel using these materials and the environments in which they are used the toxicity of these Navy-specific chemicals must be thoroughly evaluated. After documentation of the toxicity of a particular material in suitable animal models, permissible exposure guidelines will be established and safe handling procedures recommended.

Toxicity evaluations will be conducted for a variety of materials of which the Navy is a major consumer or which are used in the Navy in an unusual or unique application. Materials to be investigated include Parahoe oil-shale-derived diesel fuel, marine, JP-5, OTTO fuel and isomerized tetrahydrocyclopentadiene dimer. Toxicity tests include both acute screening and long-term inhalation and dermal exposures with subsequent life-time obsevation to assess long-term, irreversible forms of toxicity. The major experimental fraction of this effort will be carried out under the established Navy contract with the University of California, Irvine, at the Wright-Patterson AFB contractor site. Animals: Mus musculus, Rattus norvegicus, Mesocricetus auratus, Cavia porcellus, Oryctolagus cuniculus, Canis familiaris.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

3.0017, ALUMINUM AND TITANIUM COUPLING AGENTS

J.F. Boerio, University of Cincinnati, School of Engineering, Dept. of Materials Science & Metallurgical Engineering, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (DN075554; N00014-80-C-0733)

Various techniques are in use to modify the surface of aluminum and titanium prior to the formation of an adhesive joint, in order to improve joint strength and durability. Joined aluminum and titanium structures are of interest in naval aircraft to improve reliability and reduce weight by replacing rivited joints with bonded joints. In addition to the metal preparation, the use of a coupling agent is found to improve durability, but these properties depend critically on process conditions. This task will characterize the chemical structure of coupling agents adsorbed

onto metal oxide films as a function of preparation, condition and surface oxide structure.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0018, METABOLISM OF HYDRAZINE
F.N. Dost, Oregon State Higher Education System, Oregon State University, School of Agriculture, Dept. of Agricultural Chemistry, *35th & Jefferson Sts., Corvallis, Oregon* 97331 (DF320680; F33615-79-C-0517)

Research is needed to characterize metabolic pathways of potential Air Force pollutants in selected animal species to provide data for estimating if man metabolizes compounds similar to specific animals. Metabolic pathways must be identified for risk prediction on potential chemical oncogenic compounds. In particular, the biological effects of hydrazine exposure have been and are being extensively investigated, but the metabolic disposition of at least 50 percent of administered hydrazine is still unknown. The specific objective is to study the metabolic fate of the missile propellant hydrazine to aid in a better understanding of the oncogenic potential of the compound. The data will also help to develop toxicity criteria for the USAF as required by AFR 19-1.

The research proposed here is first intended to account for all hydrazine nitrogen administered, by determining the amount of hydrazine nitrogen that appears in respiration, urine and tissues as hydrazine, N2 and ammonia, and other metabolites. The potential for formation of certain probable intermediates, particularly diimide, will also be studied. The investigation will utilize the rat as the primary research animal while various chemical analyses and mass spectroscopic measurements of 15 N from 15 N-hydrazine will be employed.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Toxic Hazards Div.

3.0019, STUDY OF SPUTTERING USING ION INDUCED OPTICAL EMISSION
I.S. Tsong, Pennsylvania State University, University Park Campus, Materials Research Lab., *Research Center, Room 212, University Park, Pennsylvania* 16802 (DN875503; N00014-78-C-0593)

The process of sputtering is used in many technological areas of Navy interest ranging from depositing thin films for optical and electron device applications to its use in materials analyses techniques for surfaces and thin films. Only empirical data is available and understanding which could lead to improvements in various technological applications is non-existent.

The investigator will study the optical emission arising from the de-excitation of sputtered neutral atoms, ions, molecules, and clusters with the goal of elucidating the mechanisms governing the sputtering processes. Low energy ion scattering spectroscopy will be used to investigate the chemical nature of the sputtered surface and this characterization will be correlated with photon and ion yields. In particular, the role of oxygen as a surface or as a subsurface species on the sputtering yields and the excitation of various final states will be studied. The investigator will try to determine if excited atoms are formed by collisions at the outermost layer; and if oxygen has an effect on preferential sputtering.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0020, EVALUATION OF TEXTILES PROPOSED FOR SPACECRAFT AND AIRCRAFT CREW APPAREL
W.C. Duncan, Baylor College of Medicine, School of Medicine, Dept. of Dermatology, *1200 Moursund Ave., Houston, Texas* 77025 (NAS 9-16358)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

3.0021, CARBON-CARBON DAMAGE MODES
C. Robinson, Southwest Research Inst., *8500 Culebra Rd., P.O. Drawer 28510, San Antonio, Texas* 78228 (DN775516; N00014-77-C-0510)

Carbon-carbon materials are used in propulsion and reentry components of advanced strategic systems. Failure modes and mechanical properties are significantly affected by initial defect and flaw distributions and subsequent progressive damage under load. Significant damage (beyond the initial damage) can occur throughout the part under load before failure occurs. This research program will identify damage modes/mechanisms and sequential constituent failure in both cartesian and circumferentially woven carbon carbon materials.

A significant number of carbon-carbon material test specimens will be evaluated. A significant number will be observed under load in a scanning electron microscope. Real-time damage and crack growth will be observed. Damage mechanisms and sequential damage modes will be identified throughout the test specimens.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0022, DEVELOPMENT OF HIGH RESOLUTION GAS CHROMATOGRAPH CAPILLARY COLUMN FOR ANALYSIS OF AIRBORNE CONTAMINANTS
A. Zlatkis, University of Houston, School of Natural Sciences & Mathematics, Dept. of Chemistry, *3801 Cullen Blvd., Houston, Texas* 77004 (NAS 9-16351)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

3.0023, MILLIMETER WAVELENGTH SPECTROSCOPY OF RADICALS AND METAL COMPOUNDS
H.M. Pickett, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Chemistry, *200 W. 21st St., Austin, Texas* 78712 (F-615)

Several instrumentation improvements have been made in our millimeter wave spectrometer this year. These improvements include the installation of an InSb bolometer and two sample cells: one designed for study of radicals produced by reaction with atoms and a second designed for study of radicals produced by photolysis. Just recently, we have succeeded in observing the spectra of the HCO radical produced by photolysis of acetaldehyde. We have also completed two projects involving radicals and ions in the interstellar medium. The first is a theoretical calculation of radioactive association of H ion with D or He to form the diatomic ion. The second involves the measurement of SO2 transitions in the orion nebula region to obtain a rotational temperature.

SUPPORTED BY Robert A. Welch Foundation

3.0024, ELONGATION AND ITS RELATIONSHIP TO RESIDUAL STRESSES IN BORON FILAMENTS
F.E. Wawner, University of Virginia, School of Engineering & Applied Science, Dept. of Materials Science, *Thornton Hall, Charlottesville, Virginia* 22901 (DN675404; N00014-76-C-0694)

Composite materials are seeing increased use on aircraft and other high performance vehicles due to their specific weight and stiffness. This investigator will examine the phenomenon of elongation in boron filaments in an effort to enhance the boron production rate and thereby reduce the cost of this high strength, high stiffness reinforcement filament.

Boron filaments will be produced in a static reactor under controlled variables of temperature, gas composition, flow rate, substrate type and applied tension. Residual stresses present in the filaments, filament elongation, and filament mechanical properties will be measured. High voltage electron microscopy will be employed to determine the microstructure variations as a function of temperature and environment. A comprehensive correlation of the interactive effects of residual stresses, anelastic behavior and elongation on the mechanical properties of boron will be developed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0025, VIBRATIONAL-ROTATIONAL RELAXATION IN CHEMICAL LASERS
F.F. Crim, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Chemistry, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DN975429; N00014-79-C-0415)

Vibrational-rotational relaxation rates in molecular collisions are being determined directly. These are important in the naval areas of lasers and surveillance since they determine, for example, the state population distribution in a molecular laser and how nonequilibrium state distributions relax.

The gas handling facilities are being completed. As soon as this is finished, the first double resonance experiments with HF will be initiated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, MATERIAL SUPPORT TECHNOLOGY - STUDY OF SEMICONDUCTOR STRUCTURES
J.W. Mayer, California Inst. of Technology, School of Engineering, Dept. of Electrical Engineering, *1201 E. California Blvd., Pasadena, California* 91109 (DN475233; N00014-75-C-0564)

Development of new electronic devices and device fabrication techniques for Navy systems is dependent on better understanding and exploration of new concepts in solid state electronic materials.

Epitaxial growth of amorphous silicon on crystalline silicon substrates will be studied. Deposition rate dependence will be investigated. The role of the structure of the amorphous layer will be studied by changing other deposition or treatment conditions, i.e., by ion implantation, by varying the substrate temperature during deposition, etc. Furnace annealing will be used as well as pulsed laser and electron beam anneals for comparison. Silicide formation will be studied as a result of pulsed laser annealing. Low formation temperature silicides (nickel and platinum) and high formation temperature disilicides (chromium and vanadium) will be included.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0002, WIND TUNNEL TEST OF ENERGY EFFICIENT LIVESTOCK HAULER HAVING IMPROVED VENTILATION AND TEMPERATURE CONTROL
D.R. Sandlin, California State University & Colleges, California State Polytechnic University, Graduate School, *Kellog Campus, Pomona, California* 91768 (NAG 4-7)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

4.0003, ELECTRONIC PROCESSES IN INP AND RELATED COMPOUNDS
C.L. Anderson, Hughes Aircraft Co., Hughes Research Laboratory, *3011 S. Malibu Canyon Rd., Malibu, California* 90265 (DN890136; N00019-79-C-0533)

Determination of the characteristics of bulk InP that relate to its utility as an avalanche photo diode. A primary goal of this work shall be to measure the electron and hole ionization coefficients of commercially available bulk InP and to estimate carrier lifetimes.

InP will be characterized for physical perfection and determination of carrier concentration and mobilities. Schottky barrier and P-N junction structures will be used as analytical tools to determine ionization coefficients.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0004, ELECTRONIC STRUCTURE AND PROPERTIES OF SEMICONDUCTOR INTERFACES
F. Herman, International Business Machines Corp., Research Laboratory, *Monterey & Cottle Rd., San Jose, California* 95114 (DN975662; N00014-79-C-0814)

Naval electronics employing planar technology semiconductor devices can be improved by improved control and understanding of interfaces. This contract studies the electronic structure and properties of these interfaces.

The contractor will study interfaces between silicon and silicon dioxide, with and without relaxation of atomic positions, and with the addition of chemical impurities. In addition, studies will be made of polymorphic barriers and germanium-gallium arsenide heterojunction on (110), (100), and (111) plans.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, COMPATIBLE DIELECTRICS FOR INP DEVICES
L. Meiners, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Electronics Engineering & Sciences Dept., *San Diego, California* 92152 (DN888636)

Develop, study, and characterize dielectrics for InP which are compatible with host semiconductor in terms of interfacial properties, have adequate stability for device (FET) applications and which are technologically-feasible; namely reproducible and compatible with standard device fabrication technologies.

During FY79 a plasma CVD reactor for the low temperature growth of dielectrics on InP was designed, assembled and tested. Initial results indicated that hard, glassy layers of SiO2 can be grown at temperatures as low as 25 degrees C. These layers will be submitted to an evaluation of their bulk and interfacial electrical properties when in contact with InP and will be optimized with regard to their application to MIS FETS. Alternative dielectrics such as Si3N4 and Al2O3 will be studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0006, VSTOL PROPULSION PROBLEMS
M.F. Platzer, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN898072)

The objective of this work unit is (a) to assess the potential of mechanically excited jets to increase the secondary flow entrainment in thrust augmenting ejectors, (b) to investigate the unsteady flow/aeroelastic characteristics of transonic compressors.

Under task (a) an experiment will be performed to measure the secondary flow entrainment of mechanically excited jets for the purpose of assessing the merits of this type of excitation for use in thrust augmenting ejectors. The experiment will be similar to the set up described by Simmons, Lai and Platzer in reference (a), but will allow testing at higher pressure ratios and will use a measurement of two velocity components. The basic objective of this test is the determination of the influence of pressure ratio on mixing effectiveness of the excited jet. Under task (b) the aeroelastic studies of transonic rotors pursued during the previous year will be continued. In particular, the feasibility of installing a transonic flutter rotor in the NPS transonic compressor test facility will continue to be studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0007, SOUNDING ROCKET RESEARCH PROGRAM
F.S. Mozer, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAG 6-10)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

4.0008, COMMUNICATIONS - MAGNETOSPHERIC SUBSTORMS
R.L. McPherron, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Planetary & Space Sci-

ence, *405 Hilgard Ave., Los Angeles, California* 90024 (DN023137; N00014-75-C-0396)

The ionospheric disturbances associated with geomagnetic storms degrade or disrupt naval communications, navigation, and surveillance systems. The objective of this program is to develop an understanding of the triggering mechanism, evolution, location, extent and magnitude of geomagnetic storms required to predict their occurrence and effects on naval electromagnetic systems.

Ground and satellite magnetometer data are used to monitor micropulsations and electric currents in the magnetosphere and ionosphere during magnetic substorms. The formation of partial ring currents and its relationship to solar wind parameters and the relationship between magnetic micropulsations and triggering substorms is investigated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0009, INTERPRETATION OF PIONEER VENUS ORBITER DATA (PVOD) WITH THE TWO-DIMENSIONAL IONOSPHERE MODEL

P.T. McCormick, University of Santa Clara, School of Science, Dept. of Physics, *El Camino Rd., Santa Clara, California* 95053 (NCC 2-130)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0010, TECHNOLOGY IDENTIFICATION AND APPLICATION FOR THE ADVANCED TECHNOLOGY DISPLAY HOUSE

Unknown, University of Southern California, Graduate School, *3551 University Ave., Los Angeles, California* 90007 (NAS 2-10935)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

4.0011, MICROWAVE CIRCUIT DESIGN

R. Chowdhary, Howard University, School of Engineering, Dept. of Electrical Engineering, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NAS 5-26531)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0012, DEVELOPMENT OF SHORT GATE MICROWAVE DEVICES

G.L. Harris, Howard University, School of Engineering, Dept. of Electrical Engineering, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NAG 5-180)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0013, PULSED X-RAY SOURCES

C.M. Dozier, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN620035)

Measure pulsed X-ray interactions with materials and electronic components of Navy interest (e.g., for shielding, SGEMP, and hardening of electronics).

Measure X-ray energy deposition in materials and compare with X-ray and electron transport calculations. Determine cascade processes and depth distributions of energy deposited by secondary X-rays and electrons. Identify processes of importance to transient response and damage in materials. Extend measurements and calculations to more complex materials.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0014, OCEAN DYNAMICS

C.M. Gordon, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN120086)

The Department of Defense has need for high-power lasers that operate with high efficiency. Availability of such lasers has significance for communications and weapons application. Chemical lasers that require no external excitation and which convert chemical energy into laser power offer the prospect of highly efficient operation. The technical objective is to investigate suitable chemical laser reactions that directly result in excited state molecules that will lase at useful wavelengths with high potential power output and with high efficiency. Lasers utilizing such chemical reactions would thus become available for defense applications.

Exothermic chemical reactions which occur in static and flowing gas mixtures are being investigated for laser sources. Thermal, photochemical and electric-discharge schemes are used to initiate these reactions. Energy transfer, reaction rates and spectroscopic processes are being studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0015, LASER VULNERABILITY ADVANCED DESIGN SOLAR CELLS

R.L. Statler, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980213)

The objective is to evaluate the vulnerability of advanced design solar cells to high energy laser energy with the intent of defining specific damage modes and mechanisms. The results will provide guidelines for the design and manufacture of laser hardened solar cells for satellite applications.

Silicon and gallium-arsenide solar cells now being developed by the AF for space missions will be subjected to Co2 high energy laser radiation at 10.6 microns. Cell characteristics including forward and reverse V-I curves, spectral response, and V-I curves at AMO will be measured before and after laser radiations. The changes observed in fundamental solar cell parameters will lead to an understanding of hardening procedures to be adapted in cell manufacture.

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0016, PREDICTOR DISPLAY EXPERIMENTAL SYSTEM

D.Z. Caput, Appli Mation Inc., *1000 Woodcock Rd., Orlando, Florida* 32803 (DN994033; N61339-79-C-0125)

To develop a system to be used for the experimental evaluation of predictor displays as an aid in the training of carrier landing.

Applicable display characteristics will be determined, and display formats will be designed. Computer software will be produced to generate the displays within the context of a carrier landing simulation, and to automatically collect data on subject performance.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

4.0017, GRADUATE STUDENT RESEARCHERS PROGRAM

D. Tesar, State University System of Florida, University of Florida, School of Engineering, Dept. of Mechanical Engineering, *220 Black Hall, Gainesville, Florida* 32611 (NGT 10-005-802)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0018, MEASUREMENT OF RF ATTENUATION OF OV102 FLIGHT THERMAL PROTECTION SYSTEM (TPS) OVER ANTENNA SUBSYSTEM

W.P. Cooke, Georgia Inst. of Technology, Engineering Experiment Station, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAS 9-16353)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

4.0019, ADVANCED MICROWAVE MOISTURE SOUNDER (AMMS) MAY/JUNE 1981 WB-57 CCOPE MISSION

J.A. Gagliano, Georgia Inst. of Technology, Engineering Experiment Station, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAS 5-26528)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0020, DESIGN, DEVELOPMENT, FABRICATION AND TESTING OF A REED-SOLOMON (RS) ENCODER/DECODER UNIT

G.K. Maki, University of Idaho, School of Engineering, Dept. of Electrical Engineering, *Moscow, Idaho* 83843 (NAS 5-26534)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0021, CONTROL AND ANALYSIS SYSTEM FOR CHARGE TRANSPORT RESEARCH

C.R. Kannewurf, Northwestern University, Evanston Campus, Technological Inst., Dept. of Electrical Engineering, *633 Clark St., Evanston, Illinois* 60201 (DMR78-10929)

This equipment grant is for partial funds to purchase a charge transport measurement system, which would be used by a number of faculty members at Northwestern. The areas of research which would benefit from having this instrumentation include studies on layered transition metal dichalocogenides, fast ion conductors, mixed ionic-electronic conductors, metal alloys and intermetallic compounds, low dimensional molecular metals, conductive polymers, modulated thin films, thermoelectric materials, and optoelectronic materials. This electronic instrumentation will be operationally compatible with the major conductivity measurement equipment and computer units at Northwestern.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

4.0022, ADVANCED SONDE TECHNOLOGY

W.C. Blanchard, Bendix Corp., *1400 Taylor Ave., Baltimore, Maryland* 21204 (DN881672; N62269-78-C-0332)

Provide a vertical refractive index processing system for use with the ASW aircraft. This contract supports work XH501 DN881360.

Assemble a microprocessing system to demonstrate refractive index profiles. The microprocessor must be compatible with dropsondes using CAPS (continuous analog pressure sensor).

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Sensors & Avionics Tech Directorate

4.0023, TURBO-SHAFT ENGINE VULNERABILITY REDUCTION

W.S. Thompson, U.S. Dept. of Defense, Army, Armament Research & Development Command, Vulnerability & Lethality Div., *Aberdeen Proving Ground, Maryland* 21005 (DA0P4483)

Conduct tests and analyses to establish new evaluatory concepts for reduction of vulnerability in Army propulsion systems.

Monitor advanced technology demonstrator engine (T800) designs for maintenance of low vulnerability achievements - analyze and expand base of test data on current fleet systems using contract assistance -continue coordinating in development of USAF turbine engine compartment simulator for use in small engine compartment simulation tests.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0024, OPTICAL MEANS FOR ANALYTIC CONTINUATION

J.S. Shreve, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Harry Diamond Lab., *2800 Powder Mill Rd., Adelphi, Maryland* 20783 (DA0G5692)

To develop coherent optical processing techniques for enhancing image functions from near or far field measurements as obtained by (1.)poorly-sampled aperatures or (2.)severely space-limited aperatures -in particular as applied to radar antennas. The desired operation is one which produces a more-extensively defined field distribution in the aperture plane, or a less-ambiguous or higher-resolution angular function in the image plan than would be obtained by normal beam-forming processing.

Devise and demonstrate by laboratory experiments various beam-forming algorithms applied to simulated radar signals intercepted by (a.) an orderly array of receiving elements, (b.) a random array of elements, and (c.) a randomly-placed and severely undersampled array of receiving elements.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Harry Diamond Lab.

4.0025, HF RECEIVER AND TRANSMITTER DEVELOPMENT

H. Laping, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582780)

AF function - advance ballon systems for surveillance, reconnaissance, communications telemetry, command, environmental research. Deficiency - the existing equipment was designed in the early 60's. Reliability and age was starting to become a problem. Objective -design, develop and flight test an HF command receiver and data transmitter incorporating the latest solid state devices and modern filter technique. These components will be included in a standard balloon control instrument package to enhance reliability and system power source uniformity. How research contributes - with a standard flight control system that has been advanced to the state-of-the-art, the current need for special control systems on many of the balloon research flights will be reduced or eliminated. This will result in both dollar and manpower savings. The use of an HF command and data system is not limited to line of sight balloon flights.

A dual channel, dual conversion, narrow bandwidth HF command receiver incorporating the latest integrated circuits and transistors will be designed, bread-boarded and tested in-house by AFGL personnel. Also, an 8 watt HF data transmitter meeting all FCC specifications will be designed, bread-boarded and tested in-house. The transmitter will be able to withstand any voltage standing wave ratio with stable frequency output. In conjunction with the transmitter a matching network will be designed to transform the antenna impedances to 50 ohms so that the transmitter can be used with any length of 50 ohm coaxial cable and tedious tune-up procedures will be eliminated. From the in-house design, final flight models will be developed and tested under contract. The final units will be integrated into a standard ballon flight instrument and flight tested by AFGL personnel. A technical report will be the end product of the IHWU.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0026, MODEL REFERENCE ADAPTIVE SYSTEMS

R.V. Monopoli, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Electrical Engineering, *Amherst, Massachusetts* 01002 (ENG79-06641)

Adaptive control theory deals with control problems in the face of uncertainty. Uncertainty about or ignorance of the external environment or the internal system details often preclude the successful use of nonadaptive control theory. This research is directed toward one class of adaptive systems, the model reference adaptive systems. This class of systems encompasses parameter identifiers and adaptive observers as well as adaptive controllers. Emphasis in this work is on the adaptive controller, and there is both a theoretical and an experimental component. The theoretical part deals with the development of algorithms with improved stability and convergence properties. The experimental part deals with implementing a model reference adaptive control system on the University of Massachussetts Radio Astronomy Telescope.

The previous award number is NSF grant ENG-7616817.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0027, UNABATED RUN-UP TEST OF AV-8 AIRCRAFT

J. Grunnett, Fluidyne Engineering Corp., *5900 Olson Memorial Hwy., Minneapolis, Minnesota* 55422 (DN087290; N68305-79-C-0042)

Define exhaust flow patterns of the AV-8 aircraft and develop conceptual designs for a power check facility which allows unabated run-up of the AV-8. This work supports work unit YF61.544.091.01.015, DN987059.

The technical approach is to (1) define AV-8 exhaust flow, (2) review existing Royal Air Force facilities, (3) adapt or design at least two concepts which allow unabated run-up of the AV-8 with nozzles deflected.

SUPPORTED BY U.S. Dept. of Defense, Civil Engineering Lab., Naval Construction Battalion Center

4.0028, INVESTIGATION OF AURORAL ELECTRODYNAMICS AND ARGON RELEASE FOR CONTROLLED STUDIES (ARCS)

L.J. Cahill, University of Minnesota, Minneapolis Campus, Inst. of Technology, Dept. of Physics, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (NAG 6-11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

4.0029, STANDOFF DETECTION OF MINEFIELDS

L.E. Link, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (DA0G2032)

To develop concepts for rapid and reliable standoff procedures for detecting mined areas. Detection procedures are to be amenable to metallic-, nonmetallic-, conventional-, and scatterable-mines and are to be functional for large areas under tactical conditions.

Soviet doctrine provides for extensive use of mines for both defensive and offensive purposes. Their deployment methods are varied, and their mines are effective and diversified. During the past three decades, the U.S. has progressed little in countermine efforts. An inability to detect and neutralize minefields risks our ability to move on the battlefield. This investigation will provide concepts for noncontact (active and passive) procedures for detecting minefields which can be adapted for use in ground vehicles and/or airborne platforms such as remotely piloted vehicles, manned aircraft and spacecraft. Innovative approaches which capitalize on direct or induced anomolies between the mines or their deployment impacts on the environment and the environment itself will be stressed.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

4.0030, FLUTTER OF CONTROL SURFACES WITH STRUCTURAL NON-LINEARITIES

R. Laurenson, McDonnell Douglas Astronautics Co., *E. 411 St., St. Louis, Missouri* 63166 (DN890232; N00019-79-C-0606)

Investigate influence of structural non-linearities on the flutter characteristics of missile control surfaces.

Develop flutter analysis procedure for realistic aerodynamic loading, including influence of non-linear, higher order terms. Evaluate accuracy of Fourier representation of flutter for various non-linearities in airfoil attachment assembly.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0031, CHALCOPYRITE MOLECULAR BEAM EPITAXY FOR MICROWAVE EVALUATION

C.M. Wolfe, Washington University, School of Engineering & Applied Science, Laboratory for Applied Electrical Science, *4559 Scott Ave., St. Louis, Missouri* 63130 (DN775757; N00014-77-C-0664)

This work seeks to evaluate a new class of semiconductors (2-4-5 chalcopyrites) for usefulness in improving solid state amplifiers operating at microwave frequencies for various Navy electromagnetic systems.

Isoelectronic 2-4-5 chalcopyrite analogs of binary 3-5 semiconductors will be heteroepitaxially grown on 3-5 substrates and evaluated for mobility purity, and charge carrier transport. Initial investigations will involve CdSnP on InP.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0032, INVESTIGATION OF AURORAL ELECTRODYNAMICS AND ARGON (PLASMA) RELEASE FOR CONTROLLED STUDIES

R.L. Arnoldy, University System of New Hampshire, University of New Hampshire, School of Engineering & Physical Sciences, Dept. of Physics, *Durham, New Hampshire* 03824 (NAG 6-12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

4.0033, VIRTUAL IMAGE DISPLAY SYSTEM

P. Fegter, Advanced Technology Systems, *450 W. 1st Ave., Roselle, New Jersey* 07203 (DN794045; N61339-77-C-0113)

This virtual image display system will be an efficient, light weight, compact, low-cost virtual image device which is needed for synthetic flight trainers and tank driven simulators.

The virtual image display system will contain a combination of optical elements that convert a real image, such as a television tube, into a virtual image such that the scenery appears to be at the real world distances.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Advanced Simulation Concepts Lab.

4.0034, AUTOMATIC TEST TECHNIQUE DEVELOPMENT FOR ADVANCED ELECTRO-OPTICAL SYSTEMS

A. Lemasters, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN096119)

Develop and recommend automatic test techniques for advanced electro-optical systems and subsystems. Develop testability guidelines for future E-O avionics systems.

Support concepts and ground support equipment requirements must be considered at design inception. New testing techniques/concepts and test interface requirements developed will be converted into a testability guideline or specification to be included in development specifications for future electro-optical avionics systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0035, CRATERING AND DEBRIS EXPERIMENTAL TEST TO FURNISH THREAT MISSILE SILOS SCHOONER EVENT STUDIES

R.W. Henny, U.S. Dept. of Defense, Air Force, Weapons Lab., *Kirtland Air Force Base, Albuquerque, New Mexico* 87117 (DF161950)

To analyze experimental data gathered on the schooner event and apply the results to the survivability/vulnerability analysis of USAF protective structures requiring cratering and ejecta considerations.

Pre- and post-shot aerial stereophotography will be used to study crater and ejecta statics. Event movies will be used to study the dynamic aspects of the event. Ejecta studies also include tracer grout columns, ejecta sampling, and trenching and excavations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0036, METEOROLOGICAL TECHNIQUES FOR SMOKE APPLICATIONS

F.V. Hansen, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0F1784)

To develop empirical and theoretical analysis techniques (which integrate smoke characteristics and meteorological effects) for the determination of screening and obscuration efficiencies of smoke munitions.

Meteorological techniques such as that developed by Downs (BRL), for computing atmospheric transmittance and smoke concentration, will be used to calculate smoke effectiveness and source strength. These techniques will be developed as computer algorithms in different program languages, for utility on different computer systems. The computerized techniques then permit integration of active real-time meteorological effects (including sky condition, visibility, temperature, wind, stability, and moisture parameters) into the determination of munitions expenditure rates. Testing and validation experimentation - with real simulated data - will determine optimized techniques for programming for Army field computer systems (e.g., TACFIRE, FADAC, OL-192).

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

4.0037, CHARACTERIZATION OF THE RADIATION DAMAGE TO ELECTRO-OPTIC COMPONENTS

B.H. Rose, U.S. Dept. of Energy, Albuquerque Operations Office, *Albuquerque, New Mexico* 87115 (DF196460)

The objective of this program is to provide detailed information on the effects of radiation - in particular solar radiation - on solid-state and electro-optic components. Ultimately, this information will be used not only to assess the vulnerability of these components, but also to develop techniques that can enhance the radiation hardness of satellite components.

DDC literature search no. ACR20F accomplished. Degradation of relevant device parameters will be measured as a function of proton beam energy desposition and gamma dose rate and total dose. Initial measurements will be of power output and minority carrier lifetime in LED's and of efficiency in solar cells. In addition, transient capacitance measurements will be made on the junctions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0038, ELASTOHYDRODYNAMIC LUBRICATION OF MECHANICAL FACE SEALS FOR PROPULSION SYSTEMS

A.O. Lebeck, University of New Mexico, School of Engineering, Dept. of Mechanical Engineering, *University Hill N.E., Albuquerque, New Mexico* 87106 (DN675095; N00014-76-C-0071)

To conduct theoretical, analytical, and experimental research of the elastohydrodynamic lubrication of mechanical face seals including the effects of wear, asperity contact, thermal and mechanical elastic effects, face geometry, cavitation and leakage of particular importance to naval machinery applications.

Improve a theoretical model of mechanical face seal behavior incorporating the time-dependent interrelationships of the above parameters. Develop and apply a small scale mechanical seal test rig having the feature of imposing a controlled waviness and convergence on one seal face; this facility will provide experimental data to compliment the theoretical development.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0039, RADIATION EFFECTS ON INSULATORS USED ON ARTIFICIAL EARTH SATELLITE

J.A. Wall, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903610)

The objective of this work is to provide fundamental information on the effects of electrons, with energies corresponding to those encountered in the orbital region of the satellites, on insulating materials used in communications satellites.

There are three electron-insulator interaction phenomena relating to electrical breakdown that will be investigated. These phenomena are induced conductivity, secondary electron emission, and injected charge distribution. Literature searches will be performed in each of these areas to determine the current availability of data and its relevance to the satellite charging problem. Where data is needed, experiments will be performed to obtain the required information. These experiments will consist basically of irradiating the insulating materials with electrons of appropriate energies in a clean, oil free vacuum and measuring the induced conductivity and secondary electron emission. Injected charge distribution will be determined theoretically. The information generated by these investigations will be combined to select and test insulator-conductor combinations that will minimize the probability of space-radiation induced electrical breakdown.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0040, DETERMINATION OF EFFECTS OF AIRCRAFT PROXIMITY ON AIRDROP ITEMS

G.A. Barnard, Stencel Aero Engineering Corp., *Asheville, North Carolina* (DA0H4399)

Develop a set of objective criteria to guide the design of future airdrop aircraft so as to minimize hazards such as collisions between jumpers or between airdropped cargo and parts of the aircraft. Such hazards often arise from the aerodynamic design of the aft fuselage.

Develop computer model to quantify effects of aircraft wake on jumpers and cargo. Compile test data on aircraft wakes for input to computer model.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0041, BEARING RESEARCH FOR PROPULSION AND POWER SYSTEMS

J.F. Dill, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF451070)

Raise R. E. bearing capability to three plus mission Dn, extend bearing fatigue life and increase steel fracture toughness through better materials, increase the understanding of the fundamentals of lubrication dynamics, increase the capability of computer modelling of bearing operation.

Document the result of existing R. E. bearing analyses, conduct full scale bearing tests to verify fatigue capability, perform dynamic measurements of lubricant film thickness and traction characteristics, investigate the physical properties of lubricants needed for dynamic modelling.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0042, RESEARCH ON NEW CANDIDATE SYSTEMS FOR CHEMICAL LASERS

G. Mueller, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF458890; F33615-74-C-4006)

AF function - electromagnetic weaponry, chemical lasers. deficiency - need for new chemical lasers with improved operating, handling and logistic. Research - investigation of new candidate chemical laser systems to determine laser output spectra, pumping reactions and pertinent kinetic constants. How research contributes -provides data for evaluation of the performance of new chemical lasers and feasibility of application in Air Force systems.

Fundamental investigations will be conducted in the area of supersonic mixing and combustion, specifically related to the in-house research program and the ARL Supersonic Combustion Research Facility. These investigations will include literature survey and analysis, theoretical and numerical studies of turbulent mixing and supersonic combustion in confined hydrogen-air streams, analysis and extension of current experimental capabilities, integration of diagnostic techniques and instrumentation,

experimental program planning, and participation in conduct of experiments as appropriate.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0043, CATHODOLUMINESCENCE STUDIES OF AMPHOTERIC DOPANTS IN GaAs

Y.S. Park, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF117470)

The objective of this program is to attain a knowledge of the behavior of amphoteric dopants in epitaxial and semi-insulating GaAs with the goal of obtaining a better understanding of the thermal conversion of semi-insulating GaAs.

The work will utilize cathodoluminescence and Hall measurements as the principle techniques to analyze the characteristics of ion implanted epitaxial and semi-insulating GaAs substrates. The behavior of amphoteric dopants such as Si or C will be studied by implantation into GaAs in order to elucidate the in- or out-diffusion mechanism and changes in the lattice location of amphoteric impurities. The effect of fabrication parameters on dopant type will be assessed. Samples will be prepared under differing implantation conditions in both semi-insulating GaAs and GaAs epi-layers. Parameters such as dose rate, target temp, surface-encapsulants, and annealing conditions will be varied in preparation of the samples. Dual implantation will also be performed to determine conditions which produce n- or p-type activity in GaAs. Comparison of luminescence results with hall results should provide considerable insight into the effect of implant and annealing conditions on the behavior of amphoteric dopants implanted in GaAs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0044, CHARACTERIZATION OF III-V SEMICONDUCTOR DEVICE MATERIALS

D.C. Reynolds, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF104050)

To completely characterize the electronic impurity and defect structure of III-V semi conductors, including selected ternary and quarternary compounds. Emphasis will be given to characterization of residual, impurities, native defects, impurity dopants and concentration profiles in high purity and doped epitaxial layers and melt-grown substrate crystals. The homogeneity of impurities and lattice imperfections as well as the electronic defect structure at surfaces and interfaces of these materials will also be investigated. A major part of the effort will be devoted to impurity and defect characterization in GaAs and InP materials required for high frequency microwave and optoelectronic devices such as diode power sources, high power FETS, digital processing systems, laser diodes, optical light guides and infrared detectors.

Optical, magneto-optical and other spectroscopic techniques will be employed in conjunction w/carefully controlled crystal growth and doping, to characterize residual and doped concentrations of both shallow and deep donor and acceptor impurities, stoichiometric defects and the surface properties of GaAs and other III-V materials. Optical and magneto-optical spectroscopy, such as high resolution photo-luminescence, is one of the most powerful and sensitive methods available for characterization of the electronic defect state and is relatively cheap, non-destructive and easy to apply. Spectral measurements of surface states and their effects on electronic defect structure will be assessed. Deep impurity centers and defects will be characterized by means of near infrared spectroscopy, while far infrared local mode spectroscopy will be used to resolve and identify isoelectronic as well as donor and acceptor impurities in both n and p-type layers and substrates. Spectral results will be correlated with electrical properties and w/performance of microwave device structures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0045, GRADUATE STUDENT RESEARCHERS PROGRAM

G.J. Fix, Carnegie Mellon University, Mellon College of Science, Dept. of Mathematics, *4400 5th Ave., Pittsburgh, Pennsylvania* 15213 (NGT 39-087-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0046. GREEN LASERS FOR AIRBORNE HYDROGRAPHY

G.D. Ferguson, U.S. Dept. of Defense, Navy, Naval Air Development Center, Sensors & Avionics Tech Directorate, *Warminster, Pennsylvania* 18974 (DN081334)

To develop improved green light emitting lasers for use in coastal water hydrographic and beach reconnaissance applicatios. One goal is to develop an improved frequency doubler for use with Nd YAg lasers = 532 nm. A second goal is to develop a cavity dumped metal vapor laser =510.6 and 542nm.

Frequency doubler investigates various crystal materials, index matching fluids, optical coatings, crystal polishing techniques and cell materials. Design and test environmentally stable cell. Transfer technology to 6.4 airborne laser system. Metal vapor laser - develop improved long life laser tube. Design and construct 2-4 kHz cavity dumper. Evaluate short pulse width laser operation. Transfer technology to 6.4 hydrographic airborne laser sounder (HALS) system. Report results.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0047, GRADUATE STUDENT RESEARCHERS PROGRAM

D.R. Keefer, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Engineering Science & Mechanics, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NGT 43-001-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0048, THERMODYNAMICS AND KINETICS OF HYDROGEN-METAL SYSTEMS

R.B. McLellan, Rice University, George R. Brown School of Engineering, Dept. of Mechanical Engineering & Materials Science, *6100 Main St., Houston, Texas* 77001 (C-281)

Recent measurements of the composition and temperature variation of the elastic properties of niobium single crystals containing hydrogen in solid solution in the b.c.c. phase have been used to calculate the rigid-lattice thermodynamic functions of the solution from the measured constant pressure thermodynamic functions. The large difference between the two sets of functions show that the usual assumption of composition-independent interaction energies leads to large errors in statistical models based on rigid lattices. Current work is aimed at setting up constant-pressure models of solutions.

In order to evaluate the effects of lattice relaxation on the thermodynamic functions of a solution measured at constant pressure, the elastic properties of Pd-H solid solutions have been measured as functions of temperature and composition. The measurements indicate that the effects of lattice relaxation are large in comparison with the mixing functions.

It has been shown that, for many ternary liquid solutions, the thermochemical behavior is consistent with replacing the pairwise interaction energies by simple functions of the Allred-Rochow electro-negativities.

SUPPORTED BY Robert A. Welch Foundation

4.0049, CONTROLLED EXCITATION OF FREE STREAM TURBULENCE

A.K. Hussain, University of Houston, Cullen School of Engineering, Dept. of Mechanical Engineering, *4800 Calhoun Blvd., Houston, Texas* 77004 (DN223868; N00014-76-C-0128)

Turbulence is an important factor in many phases of ship operation, including maneuvering, control, propulsion, and stability, and in the acoustics aspects of Navy vehicles. The results of this research should lead to better understanding of turbu-

lence mechanisms leading to better predictions of turbulent boundary layers and consequently improved hardware design.

Theoretical and experimental studies of the physics of turbulence including the following problems: vortex pairing in a circular jet; antisymmetric excitation of a plane jet; and evolution of three-dimensionality in a turbulent mixing layer.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0050, CONVECTIVE HEAT TRANSFER IN SEPARATED FLOW REGIONS

J.P. Lamb, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: An extensive review and analysis of available experimental data has been completed. A computerized data base has been established which allows a judgement of the effectiveness of candidate correlation parameters. The primary uncorrelated variables are those related to geometry inasmuch as heat transfer in separated regions is due to the secondary flow field which is highly geometry dependent. Considerable success has been achieved for laminar supersonic flows. Current efforts are concentrated in the turbulent supersonic regime. Extensions of the present study to subsonic flows is also anticipated. This is the second year of a continuing experiment.

SUPPORTED BY University of Texas

4.0051, HIGH PERFORMANCE METAL-MATRIX COMPOSITES

H.L. Marcus, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712 (DN875163; N00014-78-C-0094)

Metal-matrix composites offer promise for use in Navy airframe structures, turbine engines, missiles, armor, penetrators, etc. This research effort is directed towards understanding the structure-property relationships in graphite-reinforced aluminum composites which have demonstrated high strength-to-density properties, but suffer from low transverse strength.

The program is divided into three phases. The first phase will examine fracture behavior in graphite-reinforced aluminum composites. Chemistry of the fracture surface will be related to the fiber-matrix interfaces using Auger electron spectroscopy and ion sputtering techniques. The role of residual stress in influencing the fracture will be explored. Fracture criteria will be developed that will be used in the second phase of the program to give directions for structural change of the fiber-matrix interface by thermal treatment to improve transverse strength. The third phase will introduce modifications in the process fabrication variables to improve the mechanical properties further.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0052, EXPERIMENTS ON NON-LINEAR INTERACTIONS DURING THE TRANSITION TO TURBULENCE

R.W. Miksad, University of Texas, Austin Campus, School of Engineering, Dept. of Civil Engineering, *200 W. 21st, Austin, Texas* 78712 (ENG78-00719)

The objective of this research is to experimentally identify the dominant nonlinear interactions during free shear layer transition to turbulence. A significant feature of this work involves the application of digital bispectral analysis and amplitude statistics analysis techniques to characterize the nonlinear interactions.

This set of experiments will check the Landau theory of laminar to turbulent transition process. The transition from an ordered state to one of chaos is one of the unsolved problems in Fluid Mechanics. This transition process is the key to reducing drag on bodies moving through air and water.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0053, DEVELOPMENT OF SUPERCONDUCTING TUNNEL JUNCTIONS FOR MILLIMETER-WAVE RECEIVERS

R.J. Mattauch, University of Virginia, School of Engineering & Applied Science, Dept. of Electrical Engineering, *Thornton Hall, Charlottesville, Virginia* 22901 (NAS 5-26466)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0054, GRADUATE STUDENT RESEARCHERS PROGRAM

A.R. Padhye, West Virginia University, School of Engineering, Dept. of Mechanical Engineering & Mechanics, *Morgantown, West Virginia* 26506 (NGT 49-001-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, ELECTRODEPOSITION IN MICROGRAVITY

C. Riley, University of Alabama in Huntsville, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-33812)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0002, PROJECT GALILEO - NEAR INFRARED MAPPING SPECTROSCOPY

H.H. Kieffer, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (0-9580-02443)

Continuing participation as a science member of the MIMS team on Project Galileo. Beginning instrument test and calibration. Functional design of the data processing hardware and software.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, SPACE SHUTTLE RADAR

G.G. Schaber, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeological Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (0-9580-02188)

STATE TO WHICH PROJECT PERTAINS: Arizona.

The project goals will be to further identify and refine techniques to obtain radar backscatter information on diverse terrain types that can be used to interpret radar images to be obtained by the Space Shuttle Radar (SIR-A experiment). The project will also continue to provide other types of geologic support with regard to selection of terrain targets for the mission and mission operations. Calibrated radar image data collected during Oct. 1979 at two frequencies and in multiple polarization will be thoroughly analyzed. Four frequency multipolarization radar scatterometer data (radar cross-section versus incidence angle) will be obtained over the Northern Arizona test site.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, GRADUATE STUDENT RESEARCHERS PROGRAM

L. Fox, California State University & Colleges, Humbolt State University, School of Natural Resources, Dept. of Forestry, *Arcata, California* 95521 (NGT 05-060-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0005, A RADIATIVE-CONVECTIVE MODEL STUDY OF THE CLIMATIC EFFECTS OF AEROSOLS
T.P. Ackerman, California State University & Colleges, San Jose State University, Graduate School, *Washington Sq., San Jose, California* 95192 (NCC 2-132)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0006, STUDY OF SOLAR ACTIVE REGIONS
P.E. Argo, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Environmental Sciences Dept., *San Diego, California* 92152 (DN987527)

Acquire daily radio maps of the solar disc at 0.86 cm and 2.0 cm during the peak of the present solar cycle. Acquire high time resolution maps of active regions during the times specified by the international flare/buildup study program. Normalized maps of the radio emission will be made available to the solar geophysical data publication, and to the solar physics community in general.

The La Posta 18.3 m antenna will be operated in a daily patrol mode, with emphasis made on following the time variations of specified active regions in a search for pre-flare indicators of upcoming events. The maps will be normalized using already developed Fourier transform techniques. The data will be reduced and studied relative to the studies done by other sensors in the SMM and FBS programs.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

5.0007, RESEARCH ON REMOTE SENSING UNIT
Unknown, University of California, Santa Barbara Campus, Graduate School, *Santa Barbara, California* 93106 (NCA 2-680051)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0008, NEOTECTONICS OF THE SAN ANDREAS FAULT SYSTEM-BASIN AND RANGE PROVINCE JUNCTURE
J.E. Estes, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Geography, *Santa Barbara, California* 93106 (NAG 5-177)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0009, REMOTE SENSING FOR SOIL SURVEY AND LAND USE
J.E. Cipra, Colorado State University, School of Agricultural Sciences, Dept. of Agronomy, *Fort Collins, Colorado* 80523 (0079694; COL00139)

OBJECTIVE: Investigate the use of remote sensing technology in soil survey and land inventory through innovative survey and interpretation techniques, as an aid to accelerating the Colorado Soil survey program. Coordinate the use of remote sensing technology within National Cooperative Soil Survey in the state of Colorado.

APPROACH: An area in Colorado which has an active soil survey in progress will be selected in collaboration with the State Soil Scientist. LANDSAT imagery will be obtained and initial computer analysis will be performed. Image products will be delivered to the field survey Party Chief, and SCS personnel will be briefed on the characteristics and possible ways of using the products. The field party will evaluate the image products and suggest changes as appropriate. Additional research involving the use of ground information, image contrast stretching, and other computer analysis techniques will be investigated as appropriate. A central focus throughout the project will be to develop and test techniques in remote sensing which will make an immediate, positive contribution to the field soil survey program.

SUPPORTED BY Colorado State Government

5.0010, REMOTE MONITORING OF SOURCE PARAMETERS FOR SEISMIC PRECURSORS
G.L. Choy, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Global Seismology, *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9920-02383)

To search for and to accumulate statistics about spatial and temporal changes of waveforms and source parameters that can be associated with an imminent major earthquake.

To evaluate the effectiveness of a standardized and digitally recorded global network of seismographs as a remote monitor for these spatial and temporal changes.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, GAMMA-RAY SPECTROMETRY IN URANIUM EXPLORATION
J.S. Duval, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9790-01708)

STATES TO WHICH PROJECT PERTAINS: Texas, Wyoming, Washington, California, Utah, Arizona, Colorado.

In the past fiscal year we obtained aerial survey data over nine small areas in the states of Washington, Calfiornia, Utah, Arizona, and Wyoming. Most of the current fiscal year will be devoted to data processing, interpretation, and report preparation.

We have purchased a small desk-top computer and will be investigating the use of this system in our data processing scheme.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0012, REMOTE OCEAN SENSING
K.D. Flowers, U.S. Dept. of Defense, Navy, Naval Research Lab., Acoustics Div., *Washington, District of Columbia* 20375 (DN080047)

The objective of this program is to develop a method to remotely sense and monitor the large scale thermal and density structure of ocean basins.

The approach is to use acoustic probes to sense changes in the ocean sound speed structure and relate the sound speed structure to the thermal and/or density structure. Since the relation between acoustic observables and ocean sound speed structure may not be unique several additional sources of information will be utilized. These include satellite sensed surface temperature and heights, historical information, and known physical models of ocean processes. Specifically, the theoretical analysis relating acoustic observables to the sound speed structure will be addressed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0013, IMPROVED HYPERGOLIC VAPOR REMOVAL SYSTEM
Unknown, Florida Inst. of Technology, Graduate School, *Country Club Rd., Melbourne, Florida* 32901 (NAS10-10106)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0014, GRADUATE STUDENT TRAINING PROGRAM IN OCEANOGRAPHIC REMOTE SENSING
J.J. O'Brien, State University System of Florida, Florida State University, School of Arts & Sciences, Dept. of Meteorology, *205 Wildwood Dr., Tallahassee, Florida* 32306 (NGT 10-004-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0015, REMOTE SENSING OF SURFACE EFFECTS
D.F. Lott, U.S. Dept. of Defense, Navy, Naval Coastal Systems Center, *Panama City, Florida* 32407 (DN788100)

To specify the effects of the spectral reflectance of sunlight and the transfer of incident radiation through the sea surface during various sea states.

Correlation of sea-surface expressions and spectral reflectances will be made by measuring the directional sea-state

power spectrum and the spectral incident and reflectant irradiances at the sea surface. Optical measurements will be made from an offshore fixed platform in the Gulf of Mexico and aboard ship, coinciding with the remote-sensing experiment.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Coastal Systems Center

5.0016, TWO-DIMENSIONAL SEMI-SPECTRAL MODEL OF STRATOSPHERIC DYNAMICS AND PHOTOCHEMISTRY
L.T. Gidel, University of Miami, Graduate School, *Coral Gables, Florida* 33124 (NAG 5-166)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0017, STORM HAZARDS
Unknown, Georgia Inst. of Technology, Graduate School, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAS 5-26586)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0018, REMOTE SENSING OF FOREST RESOURCES
R.M. Hoffer, Purdue University, Agricultural Experiment Station, Dept. of Forestry & Conservation, *Executive Bldg., West Lafayette, Indiana* 47907 (0032384; IND059030)

OBJECTIVE: Analyze multispectral/multi-temporal scanner data from satellite altitudes, registered to supplemental data sets, and develop a set of computer-aided techniques that can be used in a repeatable, cost-effective manner to obtain maps and acreage estimates of forest and other natural resources features.

APPROACH: Utilize LANDSAT, SKYLAB, and other multispectral scanner data. Analyze spectral data characteristics and test several techniques for computer-aided analysis of multispectral, multi-temporal scanner data. Digitally overly and register topographic, soils, and land ownership data onto LANDSAT scanner data. Define most effective techniques to obtain various types of map outputs requested by resource managers.

PROGRESS: Major emphasis this year involved development and evaluation of computer-analysis techniques to effectively utilize ancillary data in combination with satellite data in order to map forest cover types more accurately and efficiently. One project involved digital overlaying of soils and LANDSAT data. Upland hardwoods could only be separated from bottomland hardwoods by using the combined LANDSAT plus soils data. Wetland habitat areas could be distinguished from nonwetland areas with an accuracy of 84%. Another study used topographic data (elevation, aspect, and slope) in combination with Landsat data in order to map individual forest cover types in areas of mountainous terrain. Several computer analysis techniques were defined and evaluated on a test site in Colorado. The results indicated that a 15% improvement in classification performance could be achieved through the use of a 'Topographic Distribution Model' developed for the area and the 'Layered' classification technique. This approach will be verified on a test site in Central Washington during the next six months. A study was initiated to analyze simulated Thematic Mapper satellite data, obtained over a forested test site in South Carolina. Results of this study will provide guidelines for more effective utilization of the higher spatial and spectral resolution of T.M. satellite data obtained in the 1980's.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative Research Office, Indiana

5.0019, UTILIZATION OF SATELLITE CLOUD INFORMATION TO DIAGNOSE THE ENERGY STATE AND TRANSFORMATIONS IN EXTRATROPICAL CYCLONES
P.J. Smith, Purdue University, School of Science, Dept. of Geosciences, *Executive Bldg., West Lafayette, Indiana* 47907 (NAS 8-34009)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0020, C-BAND MEASUREMENTS OF RADAR BACKSCATTER FROM ICE
R.G. Onstott, University of Kansas, Lawrence Campus, Graduate School, *214 Strong Hall, Lawrence, Kansas* 66044 (NCC 1-51)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0021, INVESTIGATION OF THE RADAR RESPONSE TO SNOWPACK PROPERTIES
F.T. Ulaby, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Electrical Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NAG 5-163)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0022, CONDUCT SHORT COURSE IN REMOTE SENSING FOR STATE GOVERNMENT OFFICIALS
N.V. Weber, Murray State University, School of Environmental Sciences, Dept. of Geosciences, *Murray, Kentucky* 42071 (NAS13-177)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0023, CLIMATIC VARIABILITY, DROUGHT AND THE AGRICULTURAL ENVIRONMENT
D.M. Hershfield, U.S. Dept. of Agriculture, Agricultural Research, Plant Physiology Inst., Hydrology Lab., *Bldg. 007, Room 139B, Beltsville, Maryland* 20705 (0045295; 1109-20811-002)

OBJECTIVE: Investigate climatic variability and develop generalized models for estimating drought and other agricultural impacts. Define the joint frequency of the agriculturally important meterological elements. patterns and magnitudes of climatic variations and study the impact of anomalous meteorological events on biological and water resource systems.

APPROACH: A broad set of techniques, both analytical and graphical, will be brought to bear on the problem of climatic variations and its potential implications. Rain patterns will be generated in time and the characteristics of extremely long series will be investigated. A computer model for generating areal rainfall patterns in time and space for several AR watersheds will be developed. The possibility of using satellite imagery for estimating spatial variability of precipitation over large areas of cropland and watersheds will be investigated. Climate will be linked to its effect of probability statements. Where no systematic observations are available, the scenario approach will be used.

SUPPORTED BY U.S. Dept. of Agriculture, Agricultural Research, Beltsville Agricultural Research Center

5.0024, GRADUATE STUDENT RESEARCHERS PROGRAM
D.R. Rodenhuis, University of Maryland, College Park Campus, Graduate School, Dept. of Meteorology, *College Park, Maryland* 20742 (NGT 21-002-809)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0025, VARIABILITY OF PARTICLE SPECTRAL FUNCTIONS
R.M. Cunningham, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583020)

AF function - strategic offense. Deficiency - reentry of a ballistic weapon through clouds or precipitation causes erosion which affects weapon accuracy and survivability. Objective - to characterize the cloud and precipitation particle spectral functions and their variability in order to improve the methodology used now to determine the environment encountered by a test vehicle on its reentry trajectory. How development contributes - by leading to more accurate and less costly environmental data to document reentry erosion tests, thereby reducing the number

of tests required to establish the erosion characteristics of new materials and designs.

Data previously taken at Wallops Island, VA, and at Kwajalein Missile Range, Marshall Islands, will be studied in order to assess the efficiency and accuracy of past methods used to characterize the test vehicle environment, the uncertainties of characterization caused by measurement or analysis limitations will be judged in the light of basic limitations caused by small scale atmospheric variability. Improved methods will be developed, including entirely new approaches, i.e., use of LIDAR. These will be tested, and, if found appropriate, recommended for use by IHWU 627A0004.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0026, CORRELATIONS BETWEEN OPTICAL AND RADIO OBSERVATIONS OF CORONAL HOLES AND ENVIRONMENTAL DISTURBANCES

H.L. Demastus, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580800)

AF function - communications, surveillance, detection, tracking. deficiency - inadequate knowledge of solar environment, disturbances, and physics limits ability to predict events which disrupt and degrade af systems. Objective - to determine the correlation between solar 'coronal holes' (regions of unusually low density in the corona), as observed in both the optical and radio regions of the spectrum, and geomagnetic disturbances. How research contributes - a definite relationship has been discovered between coronal holes as observed in soft X-rays from satellites and rockets, and the source of high-speed solar wind streams. At times of low solar activity these patterns become long-lived and result in recurrent geomagnetic storms. These in turn affect Air Force systems and communications, and are the subject of prediction efforts by the Air Weather Service. Because observations of coronal holes by satellites and rockets are not available continuously, they are not well suited to ongoing prediction schemes, so AWS requires more regular observations of these phenomena. This work unit will investigate a number of possible ground-based observation schemes, as well as the specific relationship between the time and space location of coronal holes observed by these methods and geomagnetic disturbances. The success of this work unit will result in more reliable predictions of geomagnetic disturbances for AWS. This effort directly supports the task objectives of isolating causes and propagation mechanisms of solar-induced environmental disturbances.

Observations of coronal holes will be attempted in the atomic lines of FEXIV 5303A and HEI 10830A, and in the radio spectrum. The present instrument for observing FE5303 at Sacramento Peak Observatory (SPO) will be upgraded by the addition of a system designed to suppress scattered light from the objective lens and the atmosphere. The suppression instrument will be developed under contract utilizing frontier technology that is untested in this particular application. Techniques for observing HE10830 both photographically and phototelectrically will be developed in collaboration with AURA (NSF contractor) personnel at SPO. A feasibility study will be conducted to develop and test a diode-array observing system to produce spectroheliograms in HE10830 utilizing an existing instrument at SPO. (Text Abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0027, AUTOMATED IONOSPHERIC DISTURBANCE MONITORING

W.N. Hall, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF584670)

AF function - communications, surveillance, and navigation. Deficiency - ionospheric monitoring and specification for USAF by Air Weather Service is limited by data quantity and cost of data acquisition. Objective - to develop automated techniques for detection and evaluation of ionospheric disturbances using digital ionosondes, magnetometers, and riometers. How research contributes - development of automated techniques will offset data base erosion, allow consideration of additional data sources, and improve timeliness, quantity, and quality of data supplied to Air Force Global Weather Central.

Procedures for determining the magnetic Q index will be developed and installed in the SESSDAC (space environmental support system data communicator) at the AFGL Goose Base Ionospheric Observatory in Canada. The Q index has proved effective in describing high latitude phenomena such as the auroral oval. Methods for automated analysis of riometer data will be developed and installed in SESSDAC. Previously developed methods for automated determination of ionospheric parameters from compressed digisonde data will be extended to include detection and evaluation of typical high latitude disturbances at GBIO. The determination of true height electron density profiles automatically in SESSDAC using the compressed digisonde data will be studied.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0028, PRELIMINARY BEAM-PLASMA INTERACTION STUDIES

J.R. Jasperse, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583670)

AF function - satellite surviability, communications and surveillance. Deficiency - the characteristics of energetic charged-particle beams injected in the Earth's ionosphere and magnetosphere are not understood well enough to assess the space-environmental effects produced by such beams. Objective - to develop knowledge of the injection, propagation, reflection and deposition of energetic electron beams in the Earth's ionosphere and magnetosphere. How research contributes - will provide an understanding and review of the literature in the field and a recommendation of specific areas requiring further study.

The data and pertinent literature in the field will be surveyed. In an attempt to understand the data, preliminary calculations will be performed. Directions for future analytical work will be determined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0029, ANALYSIS OF ATMOSPHERE EXPLORER AND S3-1 DATA

F.A. Marcos, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581210)

AF function - airborne surveillance, target acquisition. Deficiency or opportunity - atmospheric density variations with time and space cannot be accurately predicted. Objective - to analyze density results from the AE/S3 accelerometer data base and to relate them to coordinated measurements of composition and other structure properties for the development of an improved atmospheric model. How research contributes - an improved empirical density model will be developed for the altitude region 140-250 km. More accurate density models permit improved surveillance capability and will result in less frequent recalculations by ADCOM of the orbital elements of satellites resulting in a considerable savings in computer costs and improved operational capability.

The accelerometer density data base will be expanded to include all available AE-C, -D, -E and S3-1 data. Correlative composition and temperature data will also be included where available. Studies will be made to determine properties of atmospheric variability related to (a) longitude, (b) geomagnetic activity, and (c) local time. These results will be used to complement and extend the preliminary model developed using AE-C data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0030, ATMOSPHERIC REMOTE SENSING BY GROUND-BASED LIDAR

C.R. Philbrick, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF584430)

AF function - vehicle tracking, RV trajectory prediction, interception, satellite reentry - deficiency - insufficient information on a timely basis of atmospheric density and its variations in the lower and middle atmosphere is required by advanced reentry systems and in the lower thermosphere for satellite reentry predictions. Objective - to investigate the use of LIDAR techniques for - (1) monitoring the density and temperature of the middle atmosphere, (2) measuring concentrations of certain minor species in the mesosphere, and (3) describing boundary conditions near the homopause, and to develop a LIDAR system for remote sensing of these upper atmospheric properties. How research contributes - LIDAR techniques have the potential to provide density and temperature measurements in the atmosphere (15-105km) with vertical resolution and accuracy comparable to present rocket-borne meteorological sensors. A LIDAR system could provide more data and less expensively than current meteorological sensors. The capability of monitoring some of the minor species (e.g., sodium) will help in studying the chemistry, temperature, turbulence and transport processes in the mesosphere and lower thermosphere. The measurements near the homopause will assist in defining the boundary properties necessary for the next major step in thermospheric modeling of drag effects. Sufficient synoptic data for mesospheric studies can only be obtained by remote sensing techniques such as a LIDAR.

Current laser technology will be studied and atmospheric applications evaluated to develop a LIDAR instrument for atmospheric monitoring. After the instrument has been evaluated in a laboratory situation, it will be packaged into a transportable unit for studies at other latitudes and in conjunction with radar-backscatter measurements and rocket-field programs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0031, STUDY OF DYNAMICS OF PHYTOPLANKTON PATCHES ON NANTUCKET SHOALS
R.C. Beardsley, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (NAS 1-16606)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0032, INITIAL INVESTIGATION OF SEAWATER FLUORESCENCE ABSORPTION PROPERTIES AND THEIR REVELANCE TO OCEANIC LIDAR DATA INTERPRETATION
O.C. Zafiriou, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (NAS 6-3166)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

5.0033, LANDSAT LAND-USE/LAND-COVER MAP ACCURACY ASSESSMENT
R. Taketa, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Geography, *Ann Arbor, Michigan* 48104 (NCA 2-440101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0034, USE OF AUTOMATED PROCEDURES FOR CHANGE DETECTION AND LAND USE MAPPING FROM SATELLITE DATA
H.W. West, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (DA0W8184)

To develop and demonstrate automated procedures for obtaining land-use classifications from satellite data that are acceptable for use by the Corps divisions and districts in classifying land-use changes and producing land-use maps.

Computer procedures will be developed that will automatically and/or interactively (a) locate and extract spectral data from satellite magnetic data tapes for specified geographic regions and sort the data into unique signatures on the basis of radiance values recorded for each PIXEL for four spectral bands, (b) remove instrument noise and correct radiance values for the effects of terrain slopes, shadows, and atmospheric conditions, (c) rectify postions of satellite PIXEL elements to the UTM coordinate system of topographic base maps, (d) classify the sorted radiance values on the basis of spectral signatures for five land-use types (water, woods, open or cultivated fields, urban, and other) and verify at a specific location, and (e) compare radiance values from two satellite flyovers and portray changes in land use on a map overlay. The accuracy of land-use mapping by these procedures will be demonstrated for Baton Rouge, La., and vicinity. If time permits these procedures will be applied to other areas.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

5.0035, HCMM DATA INVESTIGATION HFO-013
Unknown, Washington University, Graduate School, *Brookings 220, St. Louis, Missouri* 63130 (NAS 5-26533)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0036, GRADUATE STUDENT RESEARCHERS PROGRAM
K. Bryan, Princeton University, School of Natural Sciences, Dept. of Geological & Geophysical Sciences, *Box 430, Princeton, New Jersey* 08540 (NGT 31-001-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0037, DEVELOPMENT OF A REMOTELY SENSED AND GROUND DATA BASE IN THE NORTHERN GREAT PLAINS FOR THE STUDY OF SALT-AFFECTED SOILS
K.R. Carver, New Mexico State University, Las Cruces Campus, School of Engineering, Dept. of Electrical & Computer Egineering, *University Park, Las Cruces, New Mexico* 88003 (NAS 9-95514)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

5.0038, STUDY ERRORS APPLYING NOAA-6 AND -8 DATA INTRODUCED BY APPLYING NOAA-6 AND NOAA-8 AVHRR DATA AS AN ESTIMATOR OF VEGETATIVE INDICES
M.J. Duggin, State University of New York, Albany Campus, College of Sciences & Mathematics, Dept. of Atmospheric Science, *1400 Washington Ave., Albany, New York* 12222 (NAS 9-16331)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

5.0039, STUDY OF DYNAMICS OF PHYTOPLANKTON PATCHES ON NANTUCKET SHOALS
R.E. Wilson, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (NAS 1-16607)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0040, CLASSIFICATION OF TERRAIN COMPLEXITY BY AUTOCORRELATION
R.G. Craig, Kent State University, School of Arts & Sciences, Dept. of Geology, *Hilltop Dr., Kent, Ohio* 44240 (NAG 5-165)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0041, COOPERATIVE DEVELOPMENT OF IMPROVED COMPUTING CAPABILITY FOR LANDSAT ANALYSIS
D.L. Isaacson, Oregon State Higher Education System, Oregon State University, Environmental Remote Sensing Applications

Lab., *126 Agriculture Hall, Corvallis, Oregon* 97331 (NCA 2-586101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0042, GRADUATE STUDENT RESEARCHERS PROGRAM
D.P. Gold, Pennsylvania State University, University Park Campus, College of Earth & Mineral Sciences, Dept. of Geosciences, *116 Deike Bldg., University Park, Pennsylvania* 16802 (NGT 39-009-803)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0043, SUPPORT BROWN UNIVERSITY REGIONAL PLANETARY DATA CENTER
J.W. Head, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NASW 3508)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0044, COLUMBIA RIVER BASIN IRRIGATED LANDS STUDY
G.E. Johnson, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, EROS Data Center, Applications Branch, *Sioux Falls, South Dakota* 57198

STATES TO WHICH PROJECT PERTAINS: Washington, Oregon.

Digital LANDSAT data will be used with ancillary digital data, on terrain and soils for a spatial mode of the potential for expanded irrigation development in selected pilot areas of the Columbia River Basin. The digital data are composited in a geographic information system. A manual interpretation of sequential LANDSAT imagery will be conducted to quantitatively determine the growth of irrigation in the past and to assist in evaluating the potential for irrigation in the future.

SUPPORTED BY U.S. Dept. of the Interior, Land Information & Analysis Office, EROS Data Center

5.0045, STUDY OF TECTONIC ACTIVITY IN THE BASIN AND RANGE PROVINCE AND THE SAN ANDREAS FAULT SYSTEM
R.B. Smith, Utah Higher Education System, University of Utah, School of Mines & Mineral Industries, Dept. of Geological & Geophysical Science, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (NAG 5-164)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0046, METALLOGENIC STUDIES
P.W. Guild, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (9340-00244)

Continue assembling mineral deposit data for North America; plot data on map at 1:5,000,000, together with geologic/tectonic information, for visual analysis of their metallogenic significance, delineation of provinces and epochs, and their possible relationship to other events in earth history (particularly global tectonics). Enter data into computer storage for machine analysis in the future. Stimulate, maintain contacts with similar efforts on other continents.

Simplify, plot the data at 1:10,000,000 for the Circum-Pacific Minerals Map of NE Quadrant; advise on assembly and plotting of minerals data for the remaining quadrants (including Antarctica); codify the data for computer storage, retrieval, and analysis.

Maintain contact with IGCP Project 'Remote Sensing and Mineral Exploration', based on LANDSAT imagery and mineral deposit data; a principal objective is to evaluate the role of lineaments and circular structures in localizing mineral deposits.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0047, ACCURACY ASSESSMENT OF LAND USE AND LAND COVER MAPS PRODUCED FROM LANDSAT DIGITAL IMAGERY
G.H. Rosenfield, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, *12201 Sunrise Valley Dr., Mail Stop 710, Reston, Virginia* 22092 (G-28)

A sample selection algorithm will be programmed by NASA-Ames, drawn on the information in the LANDSAT digital classification data base, to test the accuracy of thematic maps produced from LANDSAT digital classification methods. Experiments will be conducted to investigate the relationship of PIXEL aggregation to scale of LANDSAT digital maps. Filtering techniques will be applied in these studies. Theoretical statistical problems associated with sampling techniques and accuracy determination will also be studied.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0048, USE OF CAMPUS FACILITIES AND SERVICES TO ADVANCE OPTIONS FOR EXTERNALIZATION OF VICAR/IBIS
R.D. Shinn, University of Washington, School of Architecture & Urban Planning, Dept. of Urban Planning, *Seattle, Washington* 98105 (NCA 2-850101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0049, RESEARCH RELATIVE TO MICROWAVE SEA ICE SIGNATURES
S. Martin, University of Washington, School of Arts & Sciences, Dept. of Oceanography, *Seattle, Washington* 98195 (NAG 5-161)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0050, MCIDAS METEOROLOGICAL DATA SYSTEM SYSTEM
R. Fox, University of Wisconsin, Madison Campus, Graduate School, *500 Lincoln Dr., Madison, Wisconsin* 53706 (NAS 8-33954)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0051, TECHNICAL SUPPORT TO FIRST GARB GLOBAL EXPERIMENT SPECIAL EFFORT PROGRAM
Unknown, University of Wisconsin, Madison Campus, Graduate School, *500 Lincoln Dr., Madison, Wisconsin* 53706 (NAS 5-26540)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, TERRAIN VISUAL CUE REQUIREMENTS FOR FLIGHT SIMULATION
G.H. Buckland, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223200)

1. To investigate the relative utility of different types of terrain visual cues for low altitude visual flight simulation; 2. To evaluate the relative importance of the trade-offs between the limited number of possible visual cues; and 3. To develop the optimum visual scene for ASPT, for use in other research and training which requires low-altitude visual-flight simulation.

Dual phase experiments will be used. Experienced pilots will participate in either the landing or NOE studies. The general approach will be to vary the types of visual cues available to the pilots and study the effects of these cues upon their subsequent performance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, BOOM OPERATOR PART-TASK TRAINER IOTE

T.H. Gray, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF224290)

The purpose of the initial operational test and evaluation (IOT&E) of the boom operator part-task trainer (BOPTT) is to determine the utility of using this system as an alternative to aircraft flight training for boom operators. Three studies will be performed simultaneously - the first with undergraduate boom operators to study skill acquisition, the second with highly experienced boom operators to study skill maintenance and reacquisition, and the third to study the training requirements for instructor boom operators. Finally, task frequency data on initial skill acquisition will be collected and analyzed for SAC ISD syllabus development.

The three studies will use a transfer of training methodology in which matched groups of subjects undergo a test-treatment-post-test procedural sequence. In study I, this methodology will incorporate proficiency advancement in order to accurately assess the training contribution of the BOPTT. Study 2 is essentially a classical learning/retention paradigm, while study 3 uses a 'job sample' approach based on real-world tasks. The statistical model for all studies follows a univariate group-by-treatments analysis of variance. The primary dependent variables are quantitative with questionnaires and expert ratings providing supplemental data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, EARLY CYTOLOGICAL RESPONSES OF CORTICAL AND TRABECULAR BONE TO IMMOBILIZATION & THE HISTOPATHOGENESIS OF DISUSE OSTEOPOROSIS (ABBREV)

R.J. Brown, University of San Francisco, School of Science, Dept. of Biology, *2130 Fulton, San Francisco, California* 94117 (NCC 2-135)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0004, AIRCRAFT PERSONNEL RESTRAINT SYSTEMS IMPACT DYNAMICS

J.W. Brinkley, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320450)

Current military personnel restraint system specifications require tests to determine only ultimate static breaking strength of restraint webbing material to evaluate the adequacy of restraint systems during impact. Since restraint materials are sensitive to strain rate and the dynamic response of the human body amplifies impact loads, existing static test requirements are inadequate to insure crew protection during emergency escape or aircraft crash. Recent AFSC ig findings cite unresolved technical controversy regarding the affect of webbing properties on crew protection. The objectives of this research are to (1) determine the influence of the mechanical properties of restraint systems during impact, (2) provide biodynamic data for restraint design and dynamic test criteria, and (3) acquire data for a computer model of the human body and restraint components to predict crew responses to impact environments.

The kinematic and inertial responses of volunteer subjects will be measured in a series of minus g x impact tests with three acceleration levels and three restraint harnesses. Static and dynamic tests of the restraint webbing will determine their mechanical properties. The stiffness of the harnesses will vary from 500 to 12,000 lbs/in. Human kinetic and kinematic responses will be predicted using a mathematical analog, the articulated total body model.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Biodynamics & Bionics Div.

6.0005, WORKLOAD ASSESSMENT METHODS

R.L. Hann, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321020)

The objective of this workunit is to develop prototype task batteries for assessing and predicting operator workload dictated by mission/system demands. The performance metrics produced will allow comparable quantitative measures of workload demands for a variety of crew member information processing functions essential to advanced aeronautical systems. A secondary objective is to insure that the task battery procedures, metrics, and hardware/software specifications are mutually compatible with the laboratory simulation environment as well as the development test and evaluation (DT&E)/operational test and evaluation (OT&E) environments. This effort supports AFSC development goals, TC-1, TC-2, TC-7, C3-3, RI-1, and MS-4.

Selected tasks from advanced digital information processing systems currently in conceptual or advanced development stages including DAIS, JTIDS, SDM, WMMCS, etc., will be analyzed in terms of man/computer information processing requirements. Critical problems will be identified from requirements and defined in terms of man/computer interface design for maximizing information transfer and throughput rates as determined from anticipated mission data rates. Human information processing measures and stages based on recent performance-theory developments will be analytically mapped onto the system data processing requirements. The results will be tested through experimental operator-in-the-loop part-task and mission segment simulations on the HESS. The resultant data and transfer functions will be integrated into the design of prototype task batteries for assessing workload as a function of task/equipment design and mission/system demands.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0006, MEASUREMENT, PREDICTION AND EVALUATION OF BIOENVIRONMENTAL NOISE IN SUPPORT OF AF SYSTEMS/OPERATIONS

H.K. Hille, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321430)

The goal is to provide technical support required by System program offices, MAJCOMS, airbases, AF labs, and others on specific environmental noise problems that would otherwise be outside the scope of AMRL's R&D program. This support provides 200 to 300 customers per year with the data, procedures, software, and guidance needed to define and evaluate crew and community noise problems caused by specific existing or planned Air Force operations. The range of problems include AICUZ, noise exposure/levels for environmental impact statements, facility siting, real estate decisions, monitoring of airbase noise, sound propagation, runup noise suppressors, identifying hazardous noise areas/operations, and computational/analytical methods.

The approach is to measure, predict and evaluate the customer's specific noise problem by applying the instrumentation, measurement methods, noisebank, OMEGA software, predictive methods and other tools developed by AMRL. Travel/per diem costs will generally be paid by the customer. Results will usually be documented in the form of letter reports or memoranda.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Biodynamics & Bionics Div.

6.0007, ADVANCED DISPLAY CONCEPTS

H.L. Task, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF325530)

This work unit will examine recently evolved technology for potential application to new display approaches that take advantage of reduced weight, improved form factor, increased field-of-view or any of the myriad of such factors as can contribute to improving the interface of displayed information to the operator. The effort is partially aimed at establishing techniques that can be applied by ASD to the development of an operational helmet mounted display (HMD) in the post-1980 time frame. Efforts will be directed toward exploitation of advanced technology. Specific emphasis will be placed upon alternatives to panel mounted displays for the cockpit environment.

A comprehensive technical survey will be made to include fiber optics, image conduits, various image sources and any other promising technologies that appear applicable. Laboratory work will be conducted to examine the utility of selected survey results.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0008, PHYSIOLOGICAL STUDIES OF TWO GROWTH HORMONE SECRETING CELL TYPES AND CHARACTERIZATION OF THEIR SECRETIONS

W.C. Hymer, Pennsylvania State University, University Park Campus, School of Science, Dept. of Microbiology Cell Biology Biochemistry & Biophysics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (NCA 2-589101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0009, REPEATED ACCELERATION EXPOSURE EFFECTS

E. Hendler, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881086)

To determine the psychophysiological effects of repeated exposures to acceleration loads, as applied by the dynamic flight simulator (DFS) to volunteer human subjects.

Volunteer subjects shall be repeatedly exposed to predetermined levels patterns and durations of acceleration loads using the DFS. Time between successive exposures shall vary from fractions of a minute to hours. Exposures shall be made on relaxed subjects as well as on subjects protected from acceleration effects, i.e., through the use of the anti-g suit, M1 strain-g maneuver, and reclined seat. Physiological and performance measures as well as clinical assessments shall be made before, during, and after acceleration exposures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

6.0010, QUANTITATION OF URINARY HYDROXYLYSINE METABOLITES

N.M. DiFerrante, Baylor College of Medicine, School of Medicine, Dept. of Biochemistry, *1200 Moursund Ave., Houston, Texas* 77025 (NAS 9-16387)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0011, UTILIZATION OF WOMEN IN NON-TRADITIONAL AREAS

J.A. Bergmann, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Brooks Air Force Base, San Antonio, Texas* 78235 (DF234160)

To evaluate the impact of female assignment in non-traditional areas in terms of utilization, performance, attrition, training success, task requirements, and attitudes.

A job inventory, various task factor surveys, and attitude surveys will be administered to approximately 2000 females and a 2x1 matched male sample of 431x1 and 431x2 aircraft maintenance specialist job incumbents and their supervisors. A time-2 survey will be conducted 12 months after the initial survey. Milestones- instrument development, 4 MASD, field review and revision, 6 MASD, survey administration, 8 MASD, data reduction, 11 MASD, tech school analysis, 12 MASD, survey analysis, 17 MASD, documentation phase I, 20 MASD, resurvey, 21 MASD, data reduction, 22 MASD, analysis and follow-up, 30 MASD, documentation phase II, 33 MASD.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0012, EVALUATION OF HIGH ALTITUDE PROTECTION TECHNOLOGY

J.D. Adams, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322630)

The advent of advanced concept fighter and multi-role combat aircraft has both broadened the spectrum of hazards to which aircrew are potentially exposed and led to a convergence of crew-protective philosophies among NATO allies. The US, Britain, and Canada, all share requirements to protect aircrew during high-altitude intercept, reconnaissance, or weapons delivery roles. However, only outdated, cumbersome and often dangerously compromising gear, using a variety of protective concepts and equipment combinations, is available for such needs. To assure the observance of critical minimum protective standards, Working Party 61 (of the Air Standardization Coordinating Committee) has ratified Air STD 61-011, a document which defines pressure-garment design and use criteria. To assure compliance with such guidance, together with developing a data base useful in updating/revising present recommendations, this effort will provide for continuing tri-nation cooperation in evaluation of available altitude protection technology. Previous work in this area has been documented under workunit 7164-11-01, the present work unit has been established by direction of HQ AMD to implement a new technology planning objective.

This organization has established appropriate liaison with the RAF Institute of Aviation Medicine (IAM) and Canada's Defense and Civil Institute of Environmental Medicine (DCIEM). Cooperative evaluation of selected in-service prototype garments will be conducted with test responsibilities divided among participants in a manner taking best advantage of the facilities/expertise available within each organization. Data obtained from tests of flying gear will be used to assess its compliance with existing guidance, determine suitability for use in specific flying roles and from a data base useful in future equipment design.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0013, WINDSCREEN EVALUATION - F-111 AND GENERIC

W.F. Provines, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321960)

High performance aircraft windshields designed to withstand bird impact have evolved into thick, curved, laminated new materials compositioned transparencies of large dimensions. This effort will provide optical measurements and visual performance capabilities of trained observers through a variety of segments and full scale windshields characteristic of USAF inventory and emerging aircraft. Test results will provide scientifically based tolerance values for windshield specification writers and guidance to windshield manufacturers on realistic quality control measures.

An optical laboratory has been established. The facilities and equipment provide capability for accurate determinations of transmission, haze, deviation, distortion and multiple image production for any aircraft windshield provided for study. Visual performance testing in the Physiological Optics Laboratory is being conducted. Utilizing several F-111 windshields of known optical defects, the inducted-phoria effects of vertical prism disparity are being objectively and subjectively determined. A follow-on study is planned to ascertain the induced-spatial warping effects (magnification) of those windshelds. Coordination with AMRL personnel engaged in related optical-visual performance studies will be maintained. Efforts previously documented under workunits 7755-09-01 and 7755-09-04.

SUPPORTED BY U.S. Dept. of Defense, School of Aerospace Medicine, Clinical Sciences Div.

6.0014, CLINICAL EVALUATION OF G-SENSITIVE MEDICAL CONDITIONS IN AIRCREW

J.E. Whinnery, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323590)

Assessment of the plus gz tolerance of aircrewmembers having various medical abnormalities in an effort to determine their ability to perform safely and effectively in an increased plus gz environment -establishment and refinement of plus gz tolerance norms for clinical aeromedical use - determination of the effects of specific medical therapeutics on plus gz tolerance.

Asymptomatic air-crewmembers referred to the USAFSAM aeromedical Consultation Service for evaluation of certain medical abnormalities (e.g., cardiac vascular abnormalities, cardiac arrhythmias, hypertension, abnormal exercise tolerance tests, unexplained syncope and loss of consciousness in flight) will be subjected to specific plus gz stress profiles on the USAFSAM human centrifuge. G tolerance will be measured to determine if their medical abnormalities significantly affect their plus gz tolerance. Establishment of a USAFSAM acceleration repository for input of all g-tolerance data has been accomplished so that easy retrieval and more formalized reporting of this information will be available. Further study into the validity of the specific g-test profiles will continue and will be compared with results of other clinical tests. Relaxed g-tolerance norms using a specific medical evaluation protocol have been established.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0015, GRADUATE STUDENT RESEARCHERS PROGRAM

G.E. Fox, University of Houston, Graduate School, *3801 Cullen Blvd., Houston, Texas* 77004 (NGT 44-005-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

6.0016, GRADUATE STUDENT RESEARCHERS PROGRAM

H.C. Nielson, Utah Higher Education System, University of Utah, School of Social & Behavioral Sciences, Dept. of Psychology, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (NGT 45-003-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

6.0017, STUDIES ON MAXIMUM YIELD OF WHEAT AND OTHER SMALL GRAINS IN CONTROLLED ENVIRONMENTS

F.B. Salisbury, Utah Higher Education System, Utah State University, School of Agriculture, Dept. of Plant Sciences, *Agricultural Science Bldg., Room 223A, Logan, Utah* 84321 (NCC 2-139)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0018, CONTROLLED-ENVIRONMENT INJURIES TO PLANTS

T.W. Tibbitts, University of Wisconsin, Madison Campus, School of Agriculture & Life Sciences, Dept. of Horticulture, *Agriculture Hall, Madison, Wisconsin* 53706 (NCC 2-136)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, NUMERICAL DYNAMIC ANALYSIS OF STRUCTURES BY THE FINITE DYNAMIC ELEMENT METHOD

K.K. Gupta, California Inst. of Technology, Graduate School, *1201 E. California Blvd., Pasadena, California* 91109 (DF046950; AFOSR-80-0169)

AF function - design of aerospace vehicles. Opportunity - the finite dynamic element method has been developed for efficient free vibration and dynamic response analysis of large and complex structures. Objective - the finite dynamic element method will be developed for the discretization of the continuum involving plane stress/strain, plate bending, shell and solid of revolution elements. How work contributes -more effective structure analysis techniques could develop from this work.

Using the concepts of the finite dynamic element method, six dynamic elements pertaining to various continuum will be developed and implemented in computer programs. Two eigenproblem solution procedures for the quadratic matrix equations will be studied and implemented. The free vibration analysis program will be extended to yield a dynamic response analysis capability. This will be achieved by the model superposition method.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0002, A STUDY OF A THREE-DIMENSIONAL HYPERBOLIC GRID GENERATION SCHEME

J.L. Steger, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCC 2-129)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0003, DYNAMIC PROCESSING ELEMENT MEMORY ALLOCATION FOR THE MASSIVELY PARALLEL PROCESSOR

G.W. Bell, Fort Lewis College, Undergraduate School, Dept. of Computer Science, *Durango, Colorado* 81301 (NAG 5-162)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

7.0004, NUMERICAL STUDY OF THE FLOW IN A SIMULATED WING-FUSELAGE JUNCTURE

W.R. Briley, Scientific Research Associates Inc., *P.O. Box 498, Glastonbury, Connecticut* 06033 (DN775273; N00014-77-C-0075)

The development of accurate numerical methods to describe the flow about aircraft and missiles is essential for their design and optimization. This research will study, within the framework of the compressible Navier-Stokes equations, the structure of the flow field in the vicinity of the intersection of a wall (with its accompanying boundary layer) and a wing-rounded leading edge.

The flow in the vicinity of an airplane wing-fuselage juncture is extremely complex because, in addition to being three-dimensional, it usually involves both separation and the formation of vortices. These vortices can have a pronounced effect on the wing characteristics. Because of the complicated nature of the flow, analysis is of limited value and experiments would be both time consuming and costly. The present investigation isolates the juncture region as an element of the entire flow field. Within this element the flow will be studied by an alternating direction implicit method within the framework of the Navier-Stokes equations - the only reliable description of the flow.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

7.0005, MULTILEVEL SEMANTIC ANALYSIS AND PROBLEM-SOLVING IN THE FLIGHT DOMAIN

R.T. Chien, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *106 Engineering Hall, Urbana, Illinois* 61801 (NCC 1-52)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0006, VAPOR CYCLE TRANSIENT COMPUTER MODEL
J.S. Chi, HCP Systems, *1010 Rockville Pike, Rockville, Maryland* 20852 (DF144220; F33615-79-C-3413)

This effort supports the design and analysis of vapor cycle environmental control systems, ECS, under non-steady airborne operating conditions. Currently, ECS computer programs do not provide an adequate capability for evaluation of vapor cycle systems and thus a means for comparing their characteristics with air cycle systems. The objective of this effort is to develop a capability for analyzing transient performance and controls for vapor cycle systems. The analysis tool will permit evaluation of new efficient vapor cycle cooling systems for aircraft and missiles and assessment of their potential for assuring stable operation of avionic subsystems.

A computer program will be developed, checked out, and demonstrated to perform transient analysis and design of vapor cycle ECS. The math model will be cast into the state variable format and coded to make use of general modeling and analysis capability of the easy (environmental analysis system) computer program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

7.0007, STUDY OF ANALYSIS AND MODELING OF DISTRIBUTED COMPUTING
A.K. Agrawala, University of Maryland, College Park Campus, Graduate School, Dept. of Computer Science, *College Park, Maryland* 20742 (NAS 5-22878)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

7.0008, HIGH-SPEED DATA FLOW COMPUTER ARCHITECTURE FOR THE SOLUTION OF THE NAVIER-STOKES EQUATIONS
J.B. Dennis, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering & Computer Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NCA 2-425101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0009, HIGH RESOLUTION METHODS FOR THE SOLUTION OF 2-D FLOWS WITH DISCONTINUITIES
A. Harten, New York University, Washington Square & University College of Arts & Sciences, Dept. of Mathematics, *100 Washington Sq. E., New York, New York* 10003 (NCA 2-525101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0010, STUDY OF COLLISION DANGERS FOR SPACECRAFT
V.G. Szebehely, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712 (NAS 9-16348)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, GRADUATE STUDENT RESEARCHERS PROGRAM
J.L. Horowitz, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics & Astronomy, *Huntsville, Alabama* 35807 (NGT 01-008-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0002, GRADUATE STUDENT RESEARCHERS PROGRAM
L.L. Smalley, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics & Astronomy, *Huntsville, Alabama* 35807 (NGT 01-008-802)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0003, GRADUATE STUDENT RESEARCHERS PROGRAM
P.E. Wagner, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics & Astronomy, *Huntsville, Alabama* 35807 (NGT 01-008-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0004, GRADUATE STUDENT RESEARCHERS PROGRAM
G. Neugebauer, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NGT 05-002-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0005, MAGNETIC TEXTURES AND SURFACE EFFECTS IN LIQUID 3-HE AT ULTRA LOW TEMPERATURES
H.M. Bozler, University of Southern California, School of Letters Arts & Sciences, Dept. of Physics, *3551 University Ave., Los Angeles, California* 90007 (DMR79-00830)

This research is a continuation and extension of work supported by NSF Grant No. DMR7702160. Pulsed nuclear magnetic resonance techniques will be used to investigate magnetic textures in the A phase of superfluid helium-3. Several experiments will be undertaken to observe the effects of restricted geometries on these textures in order to test various aspects of the theory of solutions. Magnetic textures generated by heat flow will be studied to test predictions of current theories regarding the nature of textures in superfluid helium-3. Thermal conduction across boundaries between liquid helium-3 and metallic surfaces will be studied at temperatures as low as 0.4MK; such data will probe the effects of magnetic coupling on the thermal conductance across boundaries. Enhanced surface magnetism of helium-3 in contact with various substrates will also be investigated. This research is important for our fundamental understanding of quantum liquids and solids.

First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0006, STUDY OF SOLAR ENERGETIC PARTICLES ACCELERATION AND PROPAGATION
E.G. Zweibel, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAS 5-26535)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0007, RARE GASES AND OTHER SYSTEMS AT HIGH PRESSURES
W.B. Daniels, University of Delaware, School of Arts & Sciences, Dept. of Physics, *Newark, Delaware* 19711 (DMR78-01307)

Thermodynamic, optical and neutron scattering properties of simple condensed phases such as solidified permanent gases, liquid crystals, and orientationally disordered crystals, are studied as functions of temperature and pressure. Condensed permanent gases, such as fluid and solid phases of helium, argon, nitrogen and methane represent the simplest systems extant with respect to intermolecular forces, hence they are the focus of much theoretical study of thermodynamic and dynamic responses. Measurement of these properties, however, has in many

cases proved difficult, producing a corresponding paucity of quantitative experimental data. Daniels has developed innovative methods for preparing samples of the condensed permanent gases by growth of crystals at high pressures for study in a constant volume experimental representation permitting extraction of various 'delicate' temperature dependencies which otherwise would be very difficult to measure quantitatively. Another area of study is that of the changeover from 'quantum' fluid or solid behavior to 'classical' behavior in the same systems at higher pressure and temperature. The studies of liquid crystal and plastic crystal phases at high pressures are aimed at clarifying models of these states of matter and reaching otherwise inaccessible polycritical points which lie off of the zero pressure axis. Most fundamentally, these measurements at high pressures contribute to establishing the form of the orientation dependent intermolecular potential by quantitative observation of the way in which characteristic temperatures scale with intermolecular distance.

This is a continuation of work supported under DMR 75-06519. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0008, DIFFRACTION FROM DEFECT CRYSTALS
D.B. Brown, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN480158)

(1) Improve quantitative understanding of the effect of lattice defects on x-ray diffraction. (2) Apply this understanding to the design of radiation diagnostics instruments and interpretation of measurements. (3) Apply this understanding to the study of radiation-induced defects in materials.

Compare calculated and measured diffraction properties. Measure defect structure by other means such as etch pitting and x-ray topography. Develop improved diffraction theory for the important range of practical crystals which are neither very perfect nor ideally imperfect. Cause controlled defect production using particle bombardment.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0009, PROFILING OF ION IMPLANTED LAYERS IN SEMICONDUCTORS
J. Comas, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN580137)

The primary objective is to measure atomic, electrical and damage profiles in ion-implanted semiconductors. The results of these measurements are to be correlated where feasible and appropriate. Emphasis will be placed on the III-V semiconductors; however, some select cases will be examined in Si. Profiling of systems which demonstrate anomalous redistribution effects will be stressed. Successful completion of this work will facilitate the application of the ion-implantation technology to device fabrication and reduce reliability problems associated with implanted device structures.

The primary approach will be to use secondary-ion mass spectrometry (SIMS) to measure atomic profiles, differential Hall measurements and CV techniques to measure electrical profiles and transmission electron microscopy to measure damage profiles. These profiles will be measured as a function of such parameters as implant fluence, implant temperature and anneal schedule.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0010, QUANTUM OPTICS
W.L. Faust, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN220140)

New techniques for generation/control of laser radiation, particularly for short pulses of high intensity. In studies of materials, use lasers to investigate nonlinear responses, very fast optically-induced proceses, and transient species. The Navy has a continuing need for new sources of optical radiaton and for information characterizing the physical properties of materials.

For studies of materials, develop advanced short pulse laser sources and adjunct capabilities for synchronous excitation, tunable probe interrogation, and detection. Study fast photochemical processes, transient intermediate species, and spectroscopy of excited states.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0011, RADIATION INTERACTION IN MATERIALS
A.W. Saenz, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680359)

To generate new research programs of high Navy relevance and to provide expert theoretical physics consultation and advice on a continuing basis to the Radiation Technology Division and Naval Research Laboratory on urgent problems in atomic and nuclear energy physics. These include feasibility studies of high-energy neutrino beams for communication over global distances, theoretical studies of a new source of intense, tunable, coherent electromagnetic radiation, and nuclear physics calculations for radiation damage and biomedical applications.

The work requires the use of state-of-the-art methods of theoretical physics, including electromagnetic, solid state, and nuclear theory, and quantum scattering theory.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0012, NEUTRINO APPLICATIONS
A.W. Saenz, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880051)

The objective is to determine the feasibility of neutrino communication over global distances, point-to-point, directly through the earth.

The work requires the use of state-of-the-art theoretical methods of high energy and nuclear physics, acoustics, and communication engineering.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0013, QUATERNARY SEMICONDUCTOR MATERIALS
E.M. Swiggard, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980021)

To prepare single crystal epitaxial films of the III-V compounds, to develop epitaxial growth technology, to lattice match layers to substrates and to develop those III-V epitaxial materials for Navy solid state electronic and electro-optic devices.

Single crystals in epitaxial form such as Ga in AsP have applications in electro-optic and electronic devices. These compounds will be prepared by various applicable expitaxial techniques including liquid phase and vapor phase. New methods of film growth are to be sought to improve material properties and processing technology. Structural match to InP substrates will be made so that the epitaxial films will be strain free with low defect interfaces. Novel growth and purity control steps will be investigated to control impurity levels and substrate epi interface. New material combinations will be investigated for both electro-optic materials and wide-band gap semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0014, ADVANCED STUDIES AND NEW INITIATIVES
E.A. Wolicki, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680011)

To undertake advanced feasibility studies, to initiate new research projects, to perform prototype measurements and experiments in radiation technology for application to Navy and DOD problems.

New techniques will be developed for using high-energy X-rays, electrons, positive ions and neutrons for testing and analyzing materials, for modifying the properties of materials, for simulating in the laboratory the extreme radiation environments existent in reactors, radiation belts, and the vicinity of nuclear explosions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0015, THEORY OF CONDENSED MATTER
G.D. Mahan, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Physics, *Memorial Hall, Bloomington, Indiana* 47401 (DMR80-16883)

Research previously supported by DMR7711305.

Theoretical research will be carried out on the electronic structure of metals, alloys, liquids, and ionic crystals. Properties such as resistivity, optical absorption and emission, and polarizability will be investigated. Specific problems will include the estimation of dynamical screening in core-level (X-ray) spectra, and the related problem of incomplete relaxation during the emission process. Also, calculations will be performed on the polarizability of ions, both in vacuum and in a crystalline environment, and on the behavior of electrons in random systems such as alloys and liquid metals.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0016, LASER LIGHT SCATTERING STUDIES OF EXCITON AND FREE CARRIER RELAXATION IN PURE AND IMPLANTED SEMICONDUCTORS
A.D. Compaan, Kansas State University, School of Arts & Sciences, Dept. of Physics, *Anderson Hall, Manhattan, Kansas* 66502 (DMR78-20607)

Experiments to study high-density exciton interactions in ion-implanted Cu2O, previously supported by Grant No. DMR-7600371, will be continued and extended to shorter wavelengths. A high-power (100 kw) pulsed dye laser will be used to create exciton densities large enough to observe changes in the photoluminescence spectrum due to exciton-exciton scattering and thermalization effects. This program will also include resonance Raman studies of other ion-implanted semiconductors such as GaAs.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, GRADUATE STUDENT RESEARCHERS PROGRAM
L. Armstrong, Johns Hopkins University, School of Arts & Sciences, Dept. of Physics, *34th & Charles Sts., Baltimore, Maryland* 21218 (NGT 21-001-981)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0018, STUDY OF ENERGETIC PARTICLE ACCELERATION
D. Eichler, University of Maryland, College Park Campus, Graduate School, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NAS 5-26582)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0019, PREPARATION AND CHARACTERIZATION OF IMPROVED SUPERCONDUCTING MATERIALS
J. Bevk, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Applied Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (DMR79-05011)

The objective of this work is to study the formation and superconducting behavior of various binary and pseudo-binary A-15 compounds prepared by new techniques such as liquid-quenching and in situ composite formation. The program will have three main parts: (1) Manipulation of microstructure of crystalline binary and pseudobinary A-15 compounds by controlled quenching from the liquid state and subsequent study of critical currents and flux-pinning mechanisms. (2) Preparation of compositionally and/or structually metastable A-15 compounds. (3) Study of superconducting properties of materials derived from transformation of amorphous alloys.

In addition the transport properties and mechanical behavior of the in situ multifilamentary composites of copper-niobium and copper-Nb-Sn will be determined. Theoretical analysis and modeling will include examination of the field effect on the superconducting volume fraction and the analysis of materials which are expected to follow a 2- or 3-dimensional behavior.

This work is a continuation of studies initiated under NSF Grant DMR74-22263A01, and is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0020, NUCLEAR RESONANCE
R.V. Pound, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (DMR79-07023)

Nuclear resonant techniques such as nuclear magnetic resonance (NMR), nuclear quadrupole resonance (NQR), and Mossbauer spectroscopy provide a means for measuring extremely small changes in energy. In this project, Mossbauer and NQR techniques will be employed in order to develop a spectroscopy for examining energy shifts in zinc-67 and tantalum-181 which have extremely narrow resonant line shapes. Thus, these isotopes offer the most sensitive opportunities for observing small energy shifts.

Tantalum-181 will be used to extend the measured accuracy of the gravitational red shift of the nuclear gamma rays. A flat glass wave guide will be constructed in order to transport the radiation from the source to the absorber - effectively focusing the radiation on the absorber.

High-field, low-temperature NMR experiments on solid hydrogen will be carried out in order to study the dynamic polarization of the nuclei. Phases of purely nuclear ordering in the solid will be sought.

This is the first year of a three-year continuing grant.

This research was previously supported under DMR 7684497 A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0021, PHYSICS OF INTENSE CHARGED PARTICLE BEAM
R. Davidson, Massachusetts Inst. of Technology, Plasma Fusion Center, *Cambridge, Massachusetts* 02139 (DN980181; N00173-79-C-0036)

The area of charged particle beam technology is becoming increasingly important to the Department of the Navy. This program theoretically investigates the equilibrium, stability, transport and radiation properties of intense charged particle beams. The objective of the program is to develop theoretical scaling laws defining the importance of the processes mentioned previously.

Theoretical and computational plasma physics techniques will be applied to the investigation of the stability and transport properties of intense ion beams. The cyclotron maser instability will be investigated in parameter ranges of interest to the NRL gyrotron program. Theoretical studies will be undertaken of non-linear effects as they pertain to microstability behavior and anomalous transport in high-temperature plasmas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0022, THEORY OF SOME DISORDERED SYSTEMS
M.F. Thorpe, Michigan State University, Graduate School, Dept. of Physics, *13 Natural Resources Bldg., East Lansing, Michigan* 48824 (DMR79-09170)

Research previously supported by DMR7705983.

This research concerns the theory of disordered systems and involves the development and refinement of some theoretical techniques and their application to real systems. These systems are usually simple and can be adequately described by a Hamiltonian containing only a few parameters.

Some of the topics to be covered are: 1. Some applications of the equation of motion technique and its extension to computations of two magnon spectra. 2. An extension of work on annealed bond Ising models to Potts models and annealed site models. 3. The development of a real-space propagator formalism, for random walk problems with applications to polymers and superionics. 4. The study of the nature of the vibrational and electronic spectra of P2O5 and Si3N4.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0023, STUDY OF UNCERTAINTY ANALYSIS OF PROJECTIONS OF INCREASED SKIN CANCER INCIDENCE RESULTING FROM OZONE REDUCTION/INCREASED UV-B

R.D. Rundel, Mississippi State University, School of Arts & Sciences, Dept. of Physics, *102 Experiment Station Bldg., Mississippi State, Mississippi* 39762 (NAS 9-16273)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

8.0024, THERMAL, ELECTRICAL, AND MAGNETIC MEASUREMENTS ON GRANULAR ALUMINUM

P. Lindenfeld, Rutgers the State University of New Jersey, New Brunswick Campus, School of Arts & Sciences, Dept. of Physics, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (DMR78-24213)

This research is a continuation and extension of work initially supported under grant DMR 7622967. The evaporation of aluminum in an oxygen atmosphere produces granular films which consist of metal grains surrounded by an insulating oxide. Depending on the details of the deposition, the grains may be in close contact or they may be only weakly coupled; consequently, the resulting composite material may be a metal, semiconductor or insulator. Thus, granular aluminum is a system in which one can study the interplay of a variety of superconducting and normal-state properties; of these, the most interesting are those related to the change of coupling between grains in the narrow range of composition near the metal-insulator transition. Measurements of the heat capacity, electrical and thermal conduction, Hall effect and magnetic susceptibility will be performed in order to characterize and correlate changes in these properties with changes in the structure of the granular films. This work is important to our fundamental understanding of this interesting class of superconducting composites as well as amorphous materials in general. Both areas of research are of central importance to the low-temperature physics program.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, ELASTOMER COMPOSITIONS FOR AIRCRAFT TIRES

G.R. Hamed, University of Akron, Buchtel College of Arts & Sciences, Dept. of Polymer Science, *302 E. Buchtel Ave., Akron, Ohio* 44325 (NCC 2-131)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0026, GRADUATE STUDENT RESEARCHERS PROGRAM

R.A. Elliott, Oregon Graduate Center, Graduate School, Dept. of Physics, *19600 N.W. Walker Rd., Beaverton, Oregon* 97005 (NGT 38-014-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0027, ULTRASONIC STUDIES OF A15 AND C15 SUPERCONDUCTING COMPOUNDS

J.A. Rayne, Carnegie Mellon University, Mellon College of Science, Dept. of Physics, *4400 5th Ave., Pittsburgh, Pennsylvania* 15213 (INT78-11294)

For eight months the principal investigator will work with Australian colleagues T. Frederick Smith and Trevor R. Finlayson of Monash University on ultrasonic studies of superconductors. The data gathered using ultrasonic techniques will be compared with other kinds of data (e.g., x-ray, Mossbauer, etc.) to gain better understanding of the elastic properties of high-temperature superconducting compounds.

The investigators will measure specifically the acoustic properties of the A15 and C15 structural classes of superconducting compounds in the temperature range from 4.2 to 300 degrees Kelvin. Using frequencies in the MHz range, the researchers will initially study single crystal V3Ge, prepared by colleagues at Australian National University, as a function of composition in order to shed light upon the anomalous thermal expansion of this compound and its relationship to the kind of tetragonal-to-cubic structural distortion found in niobium-tin compounds. Subsequent measurements of such C15 compounds as V2Hf and V2Zr will be made to gain further insight into the nature of the transformation in these materials and the connection between lattice instabilities and transition temperatures.

SUPPORTED BY U.S. National Science Foundation, Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0028, PHYSICAL ADSORPTION QUANTUM STATES ON SOLID SURFACES

D.R. Frankl, Pennsylvania State University, University Park Campus, School of Science, Dept. of Physics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (DMR77-22961)

Research on atomic beam diffraction from solid surfaces and the dynamics of the elastic scattering process previously supported by DMR-7516603 A01 will be extended as follows: (a) The precise energy-level determinations which have been completed for helium-three and helium-four on NaF and are in progress on LiF will be extended to several more alkali halides and then to other ionic crystals, especially oxides. Theoretical studies of the interaction potentials will be carried on concurrently by a colleague. (b) Semiconductors, which were previously found to give largely diffuse scattering, will be reexamined at the longer wavelengths made obtainable by a recently completed liquid-helium-cooled nozzle holder. One objective is to elucidate the structure of reconstructed surfaces. (c) Several puzzling effects of surface temperature and history will be investigated using an apparatus with in-site cleavage that is uniquely suited to this work. (d) A time-of-flight energy analyser will be added to the apparatus so as to obtain quantitative dispersion data for surface phonons.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0029, THEORY OF QUANTUM ELECTRODYNAMIC PROCESSES IN THE FIELD OF AN ATOM

R.H. Pratt, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (PHY78-26491)

Research in theoretical atomic physics initiated under NSF grant PHY7403531A04 will continue. Investigations will emphasize the study of quantum electrodynamic processes in the field of atoms and atomic ions. This includes both the study of specif-

ic radiative processes, or processes which combine quantum electrodynamic interactions with nuclear or weak interactions, and general techniques of calculation. Work will continue on bremsstrahlung and pair-production (particularly how to compactly characterize data), atomic photo-effect (behavior of dominant radial matrix elements), Rayleigh and Compton scattering, internal conversion and other nuclear transformations. Other studies include atomic environments, an analytic perturbation theory for screened potentals and approximate high-energy wave functions.

1st year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0030, THE INFLUENCE OF DEFECTS AND IMPURITIES ON THE ELECTRICAL AND OPTICAL PROPERTIES OF PYROELECTRIC CRYSTALS

J.M. Springer, Fisk University, School of Liberal Arts, Division of Natural Sciences & Mathematics, *17th Ave. N. & Meharry Blvd., Nashville, Tennessee* 37203 (NAG 8-10)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

8.0031, HIGH-VELOCITY COLLISIONS OF HIGHLY IONIZED IONS WITH ATOMS AND MOLECULES

I.A. Sellin, University of Tennessee, Knoxville Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (PHY79-07344)

This activity includes a variety of accelerator-based atomic physics experiments concerning collisions of high velocity, highly ionized particles with target atoms, molecules, and solids (foils). The work is to be carried by a group of university users at major accelerator facilities at Oak Ridge, Brookhaven, Berkeley, Darmstadt (Fed. Rep. of Germany), and occasionally other sites. Specific experiments include but are not limited to: (1) investigation of the forward peak in electron emission accompanying ion-atom and ion-solid collisions; (2) delineation of the role of single vs. multiple electron excitation processes in the formation of the forward peak and in other collision processes by means of studying such collision events in coincidence with final ion scattering state; (3) auxiliary investigation of very low-energy Auger electron emission arising from ion-atom and ion-solid collisions through use of the same coincidence techniques; (4) completion of an extensive study of electrostatic fine structure (delta n equals 0) transition probabilities in foil-excited ions; (5) study of orbital angular momentum state coherence in ion-atom collisions.

This is the first year of a three-year continuing grant, previously supported under NSF grant PHY77-05726.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0032, ANOMALOUS SOUND PROPAGATION IN METALS

J.D. Gavenda, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Physics, *200 W. 21st St., Austin, Texas* 78712 (DMR78-25232)

The recently discovered phenomenon of anomalous sound propagation in copper by conduction electrons in extended orbits will be studied by measurements with various geometries of ultrasonic wave vector and polarization. The dependence of this phenomenon on the properties of the Fermi electrons in different metals will be investigated and a quantitative theoretical model will be developed on the basis of the experimental results. Phases of the project will include: 1. the determination of the validity of pulsed-ultrasonic experimental data in the presence of extended-orbit resonances, 2. a better understanding of the mechanisms involved in direct generation of ultrasound by electromagnetic fields, 3. the reduction of ambiguity in the interpretation of magnetoacoustic data, 4. the possible explanation of anomalous microwave propagation by open-orbit electrons, and 5. the possibility of ultrasonic amplification through coupled extended-orbit resonances. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0033, ESD EFFECTS AND HYDROGEN MAPPING ON STRUCTURED METALLIC DEPOSITS

J.T. Dickinson, Washington State University, School of Arts & Sciences, Dept. of Physics, *Administration Bldg., Room 101, Pullman, Washington* 99163 (NCA 2-840102)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0034, BAND STRUCTURE OF SOLIDS AND POINT DEFECTS IN CRYSTALS

C.C. Lin, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Physics, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DMR78-27575)

Research previously supported by DMR76-83684.

Theoretical research on the structure of solid surfaces and point defects in solids will be performed. The method of linear combinations of atomic orbitals (LCAO) has proved to be a useful and versatile tool for accurate calculations of electronic energy band structures of perfect crystals, amorphous silicon, and solid surfaces. The LCAO method not only produces accurate electronic energies and wave functions, but also provides a simple picture which enables us to correlate the properties of the solid with those of the constituent atoms. Theoretical studies of electronic structures of solids by the LCAO method will be continued. The specific topics of research can be divided into two broad categories: (1) studies of impurity atoms and associated vacancies in ionic crystals, including the excited states of the impurity atoms, distortion of the valence-band states of the host crystals, charge transfer transitions and other optical processes, (2) chemisorption of chlorine atoms on III-V compound semiconductor crystal surfaces with special reference to the (110) surface of GaAs and the surface states produced by adsorbate-substrate bonding. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, GRADUATE STUDENT RESEARCHERS PROGRAM

D.J. De Smet, University of Alabama, Natural Resources Center, Dept. of Physics & Astronomy, *University, Alabama* 35486 (NGT 01-002-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

10.0002, DEVELOPMENT OF A NEW CLASS OF LIQUID HELIUM COOLED FABRY PEROT INTERFERENCE FILTER

F.J. Low, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAS 5-26575)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0003, OPTIMIZATION OF A CRYOGENIC GRATING SPECTROMETER

R.I. Thompson, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NCA 2-40101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0004, LUMINOSITY COLIBRATION OF LOW RED-SHIFT QUASARS
E.J. Wampler, University of California, Santa Cruz Campus, Graduate School, Dept. of Astronomy & Astrophysics, *Santa Cruz, California* 95060 (NAG 5-175)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0005, STELLAR PROPER MOTIONS AND PARALLAXES
A.R. Klemola, University of California, Santa Cruz Campus, Lick Observatory, Dept. of Astronomy & Astrophysics, *Mount Hamilton, California* 95140 (AST79-09098)

Astrometry is the field of astronomy concerned with the measurements of position and motions of celestial objects. This work is fundamental to all branches of astronomy, although perhaps not the most glamorous, particularly since it is necessary to pursue the measurements over long time base-lines. This project utilizes the distant galaxies as the fundamental reference system, thus providing a true inertial system. The first epoch photographic plates were obtained in the period 1947 through 1954. This project will obtain the second epoch plates. Since 1971, the start of this project, about 70 percent of the 1246 fields observable from Mt. Hamilton, California, have been obtained and half of these measured. The phase of the project represented by this grant will continue this work. The specific goals of the analyses to be carried-out are: 1. Study of the general galactic rotation and possible deviations from a smooth pattern; 2. Study of the solar motion with respect to the nearby stars and determination of local systematic corrections to the fundamental system of coordinates as defined by the basic modern catalog AGK3 for the northern sky. Other projects which may be done include the measurement of distances of selected nearby stars and the positions and motions of objects of high immediate interest, such as comets, minor planets, and selected stars.

Prior support was by NSF AST 78-14276.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0006, OPERATION OF THE IUE DATA CENTER AT BOULDER
T.P. Snow, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Astro Geophysics, *1200 University Ave., Boulder, Colorado* 80302 (NAS 5-26409)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0007, ACQUISITION OF SPECTROGRAPH FOR ASTRONOMICAL RESEARCH
W. Herbst, Wesleyan University, School of Liberal Arts & Sciences, Dept. of Astronomy, *Middletown, Connecticut* 06457 (CDP80-15491)

This award makes it possible to equip the Perkin telescope of the Van Vleck Observatory with an image tube spectrograph. The spectrograph will make it possible to obtain low dispersion spectra for classification purposes, and to study spectral variations of Orion population stars.

SUPPORTED BY U.S. National Science Foundation, Office of Planning & Resources Management, Div. of Budget & Program Analysis

10.0008, GRADUATE STUDENT RESEARCHERS PROGRAM
W.M. Jackson, Howard University, Graduate School of Arts & Sciences, Dept. of Chemistry, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NGT 09-011-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

10.0009, AN INTERACTIVE DATA PROCESSING SYSTEM FOR THE INSTITUTE FOR ASTRONOMY
J.T. Jefferies, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (AST79-26401)

The Institute for Astronomy will upgrade the present computer microdensitometer system to a full scale interactive data reduction center. Based on a powerful 32-bit address space machine, the system will provide analysis capability to handle multiple users and data from the panoramic detectors under development at the Institute.

The Institute's programs in stellar and extragalactic astronomy, solar physics and planetary astronomy and infrared research will all benefit from this addition. It will also provide a resource for visitors to the Institute from the multi-national facilities in operation on Mauna Kea.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0010, RESEARCH RELATIVE TO ELECTROFORMED X-RAY MIRRORS
M.P. Ulmer, Northwestern University, Evanston Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *633 Clark St., Evanston, Illinois* 60201 (NAG 5-181)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0011, THE EVOLUTION OF SATURN'S RINGS DUE TO EROSION MECHANISMS
R.H. Durisen, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Astronomy, *Memorial Hall, Bloomington, Indiana* 47401 (NCA 2-335101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0012, STUDIES OF THE ULTRAVIOLET SPECTRA OF CARBON STARS
H.R. Johnson, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Astronomy, *Memorial Hall, Bloomington, Indiana* 47401 (NAG 5-182)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0013, RESEARCH EQUIPMENT FOR INTERACTIVE DATA ANALYSIS
T.P. Armstrong, University of Kansas, Lawrence Campus, School of Liberal Arts & Sciences, Dept. of Physics & Astronomy, *112 Bailey Hall, Lawrence, Kansas* 66045 (ATM80-13708)

This grant will permit the purchase of research equipment to be installed in the Department of Physics and Astronomy. This equipment will be operated by department faculty and graduate students primarily for space research and solar terrestrial relations. This equipment will be supported and maintained from on-going research contract and departmental sources. It is also planned that as other departmental research projects can provide equipment and software to enhance the capacity of this facility, that these projects will participate appropriately in the use and maintenance of it. The main functions for this equipment will be to: reduce the cost of computer access to large files of data; improve the effectiveness and efficiency of research manpower; extend qualitatively and quantitatively the research problems which can be done; replace obsolete equipment.

Overall, the partial support provided here will enable a cost-effective upgrade of the research capability of several groups at the University of Kansas.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

10.0014, GRADUATE STUDENT RESEARCHERS PROGRAM
F.J. Kerr, University of Maryland, College Park Campus, Graduate School, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NGT 21-002-808)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

10.0015, GRADUATE STUDENT RESEARCHERS PROGRAM
J. Sucher, University of Maryland, College Park Campus, Graduate School, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NGT 21-002-806)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

10.0016, OPTICAL STUDIES OF HIGH ENERGETIC ASTRONOMICAL SOURCES
W. Liller, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (AST78-23814)

Investigations of highly energetic astronomical sources will be continued using: (a) the all-sky photographs in the Harvard Collection, and (b) the various accessories and telescopes of the National facilities, especially Cerro Tololo Interamerican Observatory and instruments of other observatories. The emphasis in (a) will be on historical light curves of recently unidentified quasi-stellar objects, X-ray source counterparts, and cataclysmic variables; in (b) we will concentrate on the identification and study of X-ray source counterparts, especially 'bursters', globular clusters, and extra-galactic systems.

This is a continuation of AST-7600527AO2.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0017, OBSERVATIONS OF SYMBIOTIC STARS
R.P. Kirshner, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Astronomy, *Ann Arbor, Michigan* 48104 (NAG 5-183)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0018, LUMINOUS, EXTENDED ATMOSPHERE STARS IN THE MAGELLANIC CLOUDS
S.N. Shore, Case Western Reserve University, School of Science, Dept. of Astronomy, *2165 Adelbert Rd., Cleveland, Ohio* 44106 (NAG 5-179)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0019, CHROMOSPHERIC EMISSION OF SELECTED STARS - IONIZATION STRUCTURE OF EXPANDING ATMOSPHERES
J.A. Eaton, Vanderbilt University, Graduate School, *21st Ave. S., Nashville, Tennessee* 37203 (NAG 5-176)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0020, DECELERATION OF EARTH'S ROTATION FROM OLD SOLAR OBSERVATIONS
S.J. Goldstein, University of Virginia, School of Arts & Sciences, Dept. of Astronomy, *Garrett Hall, Charlottesville, Virginia* 22903 (EAR80-06304)

The solar tables of King Alfonso X, of Kepler and of Cassini will be used to find the deceleration of the Earth's rotation. In addition to comparing the old and new longitudes, the mean daily motions of the sun from different observers will be compared. These tables extend in time from about 1252 to 1740 A.D. and each was based on many years of observations. The epoch of the observational basis for each table must be determined. Each can then be represented as a linear equation for the longitude of the sun in time.

Libraries in Washington and Baltimore contain early solar tables. The observations from which they were made will be dated. Then for an accurate subset of this data, the history of the Earth's deceleration through longitude comparison and mean motion comparison will be calculated. Improved knowledge of the changes in the length of the day has applications to geophysics, meterology, climatology and astronomy.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

GENERAL

11.0001, EU NEUTRON CAPTURE, REGOLITH DYNAMICS AND LUNAR STRATIGRAPHY
D.J. DePaolo, University of California, Berkeley Campus, Graduate School, *2200 University Ave., Berkeley, California* 94720 (NAG 9-15)

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VOLUME 19 NUMBER 21/ NOVEMBER 8, 1981

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N81-30080*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFLUENCE OF FRICTION FORCES ON THE MOTION OF VTOL AIRCRAFT DURING LANDING OPERATIONS ON SHIPS AT SEA
James C. Howard and David O. Chin Sep. 1981 40 p refs (NASA-TM-81305; A-8641) Avail: NTIS HC A03/MF A01 CSCL 01B

Equations describing the friction forces generated during landing operations on ships at sea were formulated. These forces depend on the platform reaction and the coefficient of friction. The platform reaction depends on the relative sink rate and the shock absorbing capability of the landing gear. The friction coefficient varies with the surface condition of the landing platform and the angle of yaw of the aircraft relative to the landing platform. Landings by VTOL aircraft, equipped with conventional oleopneumatic landing gears are discussed. Simplifications are introduced to reduce the complexity of the mathematical description of the tire and shock strut characteristics. Approximating the actual complicated force deflection characteristic of the tire by linear relationship is adequate. The internal friction forces in the shock strut are included in the landing gear model. A set of relatively simple equations was obtained by including only those tire and shock strut characteristics that contribute significantly to the generation of landing gear forces. A.R.H.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N81-30081 New York Univ., N. Y.
UNSTEADY TRANSONIC FLOW PAST AIRFOILS IN RIGID BODY MOTION Ph.D. Thesis
I-Chung Chang 1981 201 p
Avail: Univ. Microfilms Order No. 8115537

With the aim of developing a fast and accurate computer code for predicting the aerodynamic forces needed for a flutter analysis, some basic concepts in computation are reviewed. The unsteady transonic flow past airfoils in rigid body motion is adequately described by the potential flow equation as long as the boundary layer remains attached. The two dimensonal unsteady transonic potential flow equation in quasilinear form with first order radiation boundary conditions is solved by an alternating direction implicit scheme in an airfoil attacked sheared parabolic coordinate system. Numerical experiments show that the scheme is very stable and is able to resolve the highly nonlinear transonic effects for flutter analysis within the content of an inviscid theory Dissert. Abstr.

N81-30082*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARISONS OF AEROX COMPUTER PROGRAM PREDICTIONS OF LIFT AND INDUCED DRAG WITH FLIGHT TEST DATA
John Axelson and Gary C. Hill Aug. 1981 78 p refs (NASA-TM-81237; A-8344) Avail: NTIS HC A05/MF A01 CSCL 01A

The AEROX aerodynamic computer program which provides accurate predictions of induced drag and trim drag for the full angle of attack range and for Mach numbers from 0.4 to 3.0 is described. This capability is demonstrated comparing flight test data and AEROX predictions for 17 different tactical aircraft. Values of minimum (skin friction, pressure, and zero lift wave) drag coefficients and lift coefficient offset due to camber (when required) were input from the flight test data to produce total lift and drag curves. The comparisons of trimmed lift drag polars show excellent agreement between the AEROX predictions and the in flight measurements. S.F.

N81-30083*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL AERODYNAMIC CHARACTERISTICS OF TWO V/STOL FIGHTER/ATTACK AIRCRAFT CONFIGURATIONS AT MACH NUMBERS FROM 1.6 TO 2.0
Walter P. Nelms, Donald A. Durston, and J. R. Lummus (General Dynamic Corp., Fort Worth, Tex.) May 1981 292 p refs Sponsored in part by the Navy (NASA-TM-81286; A-8559) Avail: NTIS HC A12/MF A01 CSCL 01A

Tests were conducted in the Ames 9 by 7 ft supersonic wind tunnel to measure the aerodynamic characteristics of two horizontal attitude takeoff and landing V/STOL fighter/attack aircraft concepts. One concept featured a jet diffuser ejector for its vertical lift system and the other employed a remote augmentation lift system (RALS). Test results for Mach numbers from 1.6 to 2.0 are reported. Effects of varying the angle of attack (-4 deg to +17 deg), angle of sideslip (-4 deg to +8 deg) Mach number, and configuration building were investigated. The effects of wing trailing edge flap deflections, canard incidence, and vertical tail deflections were also explored as well as the effects of varying the canard longitudinal location and shapes of the inboard nacelle body strakes. A.R.H.

N81-30084*# Boeing Commercial Airplane Co., Seattle, Wash.
AN INVESTIGATION OF ENGINE INFLUENCE ON INLET PERFORMANCE
Brent K. Hodder 1981 88 p refs (Contract NAS2-06017) (NASA-CR-166136; D6-49228) Avail: NTIS HC A05/MF A01 CSCL 01A

The performance of a conventional engine/inlet installation, in which inlet and engine flow field interaction occurs, was compared to the performance of the same inlet remote coupled to the engine. The remote coupled inlet configuration decouples

the influence of the engine on the inlet flow field and simulates current small scale inlet test techniques in which inlet airflow is provided by a vacuum source or coupled engine. The investigation was conducted in the NASA-Ames 40- by 80-foot wind tunnel using a General Electric TF-34 turbofan engine and a subsonic inlet havng an average inlet contraction ratio of 1.26. Test results indicated that engine interaction allows the inlet to operate with lower distortion levels at and beyond the separation angle-of-attack experienced without engine interaction. T.M.

N81-30085*# Douglas Aircraft Co., Inc., Long Beach, Calif.
ANALYSIS OF MACH NUMBER 0.8 TURBOPROP SLIP-STREAM WING/NACELLE INTERACTIONS Final Report
H. Robert Welge, Dan H. Neuhart, and John A. Dahlin 6 Aug. 1981 84 p refs
(Contract NAS2-10881)
(NASA-CR-166214; ACEE-25-FR-1564) Avail: NTIS HC A05/MF A01 CSCL 01A

Data from wind tunnel tests of a powered propeller and nacelle mounted on a supercritical wing are analyzed. Installation of the nacelle significantly affected the wing flow and the flow on the upper surface of the wing is separated near the leading edge under powered conditions. Comparisons of various theories with the data indicated that the Neumann surface panel solution and the Jameson transonic solution gave results adequate for design purposes. A modified wing design was developed (Mod 3) which reduces the wing upper surface pressure coefficients and section lift coefficients at powered conditions to levels below those of the original wing without nacelle or power. A contoured over the wing nacelle that can be installed on the original wing without any appreciable interference to the wing upper surface pressure is described. J.D.H.

N81-30086*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SIMULATED IN-FLIGHT THRUST REVERSING ON VERTICAL-TAIL LOADS OF F-18 AND F-15 AIRPLANE MODELS
E. Ann Bare, Bobby L. Berrier, and Francis J. Capone Aug. 1981 53 p refs
(NASA-TP-1890; L-14531) Avail: NTIS HC A04/MF A01 CSCL 01A

Investigations were conducted in the Langley 16-Foot Transonic Tunnel to provide data on a 0.10-scale model of the prototype F-18 airplane and a 0.047-scale model of the F-15 three-surface configuration (canard, wing, and horizontal tails). Test data were obtained at static conditions and at Mach numbers from 0.6 to 1.2 over an angle-of-attack range from 2 deg to 15 deg. Nozzle pressure ratio was varied from jet off to about 8.0. T.M.

N81-30087*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WING-ALONE AERODYNAMIC CHARACTERISTICS FOR HIGH ANGLES OF ATTACK OF SUPERSONIC SPEEDS
Robert L. Stallings, Jr. and Milton Lamb Jul. 1981 190 p refs
(NASA-TP-1889; L-14546) Avail: NTIS HC A09/MF A01 CSCL 01A

An experiment was conducted to determine wing-alone supersonic aerodynamic characteristics at high angles of attack. The wings tested varied in aspect ratio from 0.5 to 4.0 and in taper ratio from 0 to 1.0. The wings were tested at angles of attack ranging rom -5 deg to 60 deg and at Mach number from 1.60 to 4.60. The aerodynamic characteristics were obtained by integrating local pressures measured over the wing surfaces. Presented and discussed are results showing the effects of aspect ratio, taper ratio, Mach number, and angle of attack on force and moment coefficients and center of pressure locations. Also included are tabulations of the pressure measurements. T.M.

N81-30088*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTER ANALYSIS OF FLOW PERTURBATIONS GENERATED BY PLACEMENT OF CHOKE BUMPS IN A WIND TUNNEL
Richard L. Campbell Aug. 1981 44 p refs
(NASA-TP-1892; L-14415) Avail: NTIS HC A03/MF A01 CSCL 01A

An inviscid analytical study was conducted to determine the upstream flow perturbations caused by placing choke bumps in a wind tunnel. A computer program based on the stream-tube curvature method was used to calculate the resulting flow fields for a nominal free-stream Mach number range of 0.6 to 0.9. The choke bump geometry was also varied to investigate the effect of bump shape on the disturbance produced. Results from the study indicate that a region of significant variation from the free-stream conditions exists upstream of the throat of the tunnel. The extent of the disturbance region was, as a rule, dependent on Mach number and the geometry of the choke bump. In general, the upstream disturbance distance decreased for increasing nominal free-stream Mach number and for decreasing length-to-height ratio of the bump. A polynomial-curve choke bump usuelly produced less of a disturbance than did a circular-arc bump and going to an axisymmetric configuration (modeling choke bumps on all the tunnel walls) generally resulted in a lower disturbance than with the corresponding two dimensional case. Author

N81-30089# Science Applications, Inc., Irvine, Calif. Aeronautical Systems Technology Div.
MARK 4 SUPERSONIC-HYPERSONIC ARBITRARY-BODY PROGRAM MODIFICATIONS AND COMPUTER GRAPHICS. *VOLUME 1: SURFACE STREAMLINE TRACING* Final Technical Report, May 1978 - Dec. 1980
S. Taylor Wright-Patterson AFB, Ohio AFWAL Jan. 1981 131 p refs 2 Vol.
(Contract F33615-78-C-3001; AF Proj. 2404)
(AD-A101660; AFWAL-TR-80-3117-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 20/4

Modifications were made to two areas of the Mark IV Supersonic Arbitrary-Body program. First, the previous streamline method was replaced with one capable of tracing continuous surface streamlines. The method includes a means of locating the origins of the streamlines. Changes were also made to the viscous methods in the Mark IV code. The integral boundary layer methods, which must be applied along inviscid streamlines, were modified to ensure their compatibility with the new streamline method. Several discrepancies were observed in the previous coding of the integral methods, and the problems were corrected. Author (GRA)

N81-30090# Science Applications, Inc., Irvine, Calif. Aeronautical Systems Technical Div.
MARK 4 SUPERSONIC-HYPERSONIC ARBITRARY-BODY PROGRAM MODIFICATIONS AND COMPUTER GRAPHICS. VOLUME 2: COMPUTER GRAPHICS Final Technical Report, May 1978 - Sep. 1980
S. Taylor Wright-Patterson AFB, Ohio AFWAL Oct. 1980 89 p refs 2 Vol.
(Contract F33615-78-C-3001; AF Proj. 2404)
(AD-A101661; AFWAL-TR-80-3117-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

An interactive computer graphics program, TEKPIC, was developed for validating geometries prepared for the Mark IV Supersonic-Hypersonic Arbitrary-Body program. The TEKPIC program is also capable of displaying surface streamlines generated by the modified Mark IV program. A separate computer graphics program, HIDDEN, was constructed from existing computer codes, unlike TEKPIC, is capable of removing hidden lines. Program HIDDEN is operated in a batch mode to produce Calcomp plots. Author (GRA)

N81-30091# Auburn Univ., Ala. Engineering Experiment Station.
AN AERODYNAMIC ANALYSIS OF DEFORMED WINGS IN SUBSONIC AND SUPERSONIC FLOW Final Report, Jan. 1980 - Apr. 1981
John E. Burkhalter, John M. Abernathy, and Milton E. Vaughn, Jr. Apr. 1981 201 p refs
(Contract DAAG29-78-G-0036)
(AD-A101675; ARO-15666.4-A-E) Avail: NTIS HC A10/MF A01 CSCL 20/4

The aerodynamic loading for deformed wings with elevons in both subsonic and supersonic flow is considered. The solution

procedure falls into the potential flow category with appropriate restrictions. For subsonic flow, a lifting surface Kernel function formulation is used in which the local pressure loading for both wing and elevon is determined simultaneously in a semi-closed summation manner. Cases under study included gaps between wing and elevon in addition to arbitrary wing-elevon deformations. Results for all cases compared very well with experimental data. Experimental data taken in a low speed wind tunnel is also presented for a cropped delta wing and rectangular elevon in which the wing-elevon gap was the primary test variable. For supersonic flow, 3-D supersonic theory forms the basis for the solution procedure. Deformations are accounted for with the use of the doublet paneling added to the basic 3-D solution. Results agree very well with existing experimental data. The gapped elevon and thick wing trailing edge problem is also addressed with satisfactory results. Author (GRA)

N81-30092# ARO, Inc., Arnold Air Force Station, Tenn.
EXPERIMENTAL METHOD FOR CORRECTING NOZZLE AFTERBODY DRAG FOR THE EFFECTS OF JET TEMPERATURE Final Report, Oct. 1978 - Aug. 1980
W. L. Peters AEDC Jul. 1981 50 p refs
(AD-A101614; AEDC-TR-80-38) Avail: NTIS HC A03/MF A01 CSCL 20/4

The objective of this investigation was to isolate those parameters defined as jet mixing effects on afterbody drag in an effort to develop a method of correcting or simulating the effects of jet temperature in wind tunnel experiments. Data used in the investigation were obtained from experiments conducted in the AEDC Aerodynamic Wind Tunnel (1T) with a strut-mounted model at free-stream Mach numbers from 0.6 to 1.2. Integrated afterbody pressure drag coefficient data were acquired for three nozzle area ratios (1.0, 1.24, and 2.96) using various unheated jet exhaust gas compositions that allowed a variation in gas constant from 55 to 767 ft/lbf/lbm-deg R. Jet mixing effects on afterbody drag coefficient produced by varying jet gas constant and nozzle area ratio at nozzle design pressure ratio, and the drag effects resulting from variations in nozzle pressure ratio at certain overexpanded jet conditions were observed to be similar functions of mass flux ratio. A simple experimental method has been proposed to allow corrections of afterbody drag coefficient data obtained in the wind tunnel (using an ambient temperature air jet) for the effects of jet gas constant. By inference, a similar drag correction can be obtained for the combined effect of gas constant and temperature, assuming their product defines the effects on drag produced by variations in either property.
Author (GRA)

N81-30093# Sandia Labs., Albuquerque, N. Mex. Aerodynamic Simulation Div.
UTILIZATION OF HYBRID COMPUTATIONAL EQUIPMENT FOR THE SIMULATION OF PARACHUTE SYSTEM FLIGHT
W. H. Curry and P. R. Schatzle 1981 24 p refs Presented at the Summer Computer Simulation Conf., Washington, D.C., 15-17 Jul. 1981
(Contract DE-AC04-76DP-00789)
(SAND-80-2549C; CONF-810701-1) Avail: NTIS HC A02/MF A01

Analog/digital simulation of parachute retarded configurations was conducted. Implementation of specific mathematical models on a hybrid computer is described, and example results are presented. DOE

N81-30094# Technische Universitaet, Munich (West Germany). Inst. Luft- und Raumfahrt.
ON THE SUPERSONIC AND MILDLY SUPERSONIC FLOW FIELDS AROUND WAVERIDERS [UEBER DAS STROEMUNGSFELD VON WELLENREITERN IM UNTERSCHALL UND NIEDRIGEM UEBERSCHALL]
Hilmar Hoder 1980 140 p refs In GERMAN
(ILR-51; ISSN-0341-0587; ISBN-3-7983-0725-9) Avail: NTIS HC A07/MF A01

Wind tunnel for waveriders to be used on supersonic spacecraft are reported. Two types of waveriders are considered: (1) Nonvweiler or caret wing waveriders, and (2) Jones waveriders. Results show similarity with the flow around slender delta wings for a symmetrically incident flow. Significant differences were obtained when the angle of attack was not zero. bottom are given special attention. The flow fields are also computed according to slender body theory by singularities distributed on the body contour. Leading edge separation is incorporated and a vortex model consisting of discrete vortices is added. The results are in agreement for both waverider types for flows without leading edge separation. On the other hand, less agreement is obtained for the pressure distribution on the upper side of the model. Author (ESA)

N81-30095# British Aerospace Aircraft Group, Warton (England).
THE PREDICTION OF WING-BODY INTERFERENCE USING THE BAE, WARTON Mk 2 PANEL PROGRAM AND COMPARISON WITH DATA-SHEET RESULTS
S. E. Sutcliffe Jan. 1981 30 p refs
(BAE-AE/A/673) Avail: NTIS HC A03/MF A01

Traditionally used wing-body interference factors are evaluated. They are based on the use of slender body theory and presented as Datcom data sheets. The evaluation is based on the use of the Mk 2 Panel Program which within the limitation of potential flow gives a proper representation of three dimensional effects. The configurations tested were simple enough to be generated automatically using the Mk 2 facilities and involved a minimum of data generation time. The results show that Datcom approximations are reasonable for large wings but their agreement with three dimension theory deteriorates as wing size decreases. Wing height and body cross section effects are presented, in summary form to supplement the Datcom factors. Author (ESA)

N81-30096# Alaska Legislative Affairs Agency, Juneau.
AIRSHIPS: POTENTIAL ALASKAN TRANSPORTATION ALTERNATIVE
O. Alexander Hoke Mar. 1981 124 p
(PB81-194615; HRA-80-12) Avail: NTIS HC A06/MF A01 CSCL 01C

Airship research included: (1) airships as a mode of transportation; (2) developers of airships internationally; (3) economics of airship acquisition and operation; (4) potential transportation opportunities afforded by airships in Alaska. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N81-30097 Societe Nationale Industrielle Aerospatiale, Paris (France). Aircraft Div.
CIVIL TRANSPORT AIRCRAFT AT THE TURN OF THE CENTURY
P. Lecomte and P. Dupuy 1980 11 p ref
(SNIAS-801-150-101) Avail: NTIS HC A02

The probable evolution of fuel prices, world population, total energy demand, energy sources and transport system competition is analyzed. The sort of aircraft that will be required include medium range transport aircraft, long range aircraft, and aircraft for the third world. The technological trends are examined with particular reference to (1) the turbofan engine; (2) weight saving through structural design optimization and use of composite materials; and (3) fly-by-wire controls. It is concluded that the principal revolution to come results directly or indirectly from electronics and computer processing. Author (ESA)

N81-30098*# Control Data Corp., Hampton, Va.
LEARNING GUIDE FOR THE TERMINAL CONFIGURED VEHICLE ADVANCED GUIDANCE AND CONTROL SYSTEM MODE SELECT PANEL
Mark A. Anderson and Ron Callahan Jul. 1981 20 p refs
(Contract NAS1-15673)
(NASA-CR-165751) Avail: NTIS HC A02/MF A01 CSCL 01C

This learning guide is designed to assist pilots in taking the PLATO presimulator training course on the advanced guidance and control system mode select panel. The learning guide is

divided into five sections. The first section, the introduction, presents the course goals, prerequisites, definition of PLATO activities, and a suggested approach to completing the course. The remaining four sections present the purpose, learning activities and summary of each lesson of the AGCS PLATO course, which consists of (1) AGCS introduction; (2) lower order modes; (3) higher order modes; and (4) an arrival route exercise. Author

N81-30099*# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
A COMPARISON OF SOME STATIC AND DYNAMIC MECHANICAL PROPERTIES OF 18 X 5.5 AND 49 X 17 TYPE 7 AIRCRAFT TIRES AS MEASURED BY THREE TEST FACILITIES Final Report
Richard N. Dodge and Samuel K. Clark Hampton, Va. NASA. Langley Research Center Jul. 1981 86 p refs
(Grant NsG-1494)
(NASA-CR-165720) Avail: NTIS HC A05/MF A01 CSCL 01C

The properties were measured during static, slow rolling, and high-speed tests, and comparisons were made between data as acquired on indoor drum dynamometers and on an outdoor test track. In addition, mechanical properties were also obtained from scale model tires and compared with corresponding properties from full-size tires. While the tests covered a wide range of tire properties, results seem to indicate that speed effects are not large, scale models may be used for obtaining some but not all tire properties, and that predictive equations developed in NASA TR R-64 are still useful in estimating most mechanical properties. T.M.

N81-30100*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA AVIATION SAFETY REPORTING SYSTEM Quarterly Report
Dec. 1980 41 p refs Prepared in cooperation with Battelle Columbus Labs., Mountain View, Calif.
(NASA-TM-81252; A-8415; QR-12) Avail: NTIS HC A03/MF A01 CSCL 01C

Problems in briefing of relief by air traffic controllers are discussed, including problems that arise when duty positions are changed by controllers. Altimeter reading and setting errors as factors in aviation safety are discussed, including problems associated with altitude-including instruments. A sample of reports from pilots and controllers is included, covering the topics of ATIS broadcasts an clearance readback problems. A selection of Alert Bulletins, with their responses, is included. S.F.

N81-30101*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GUIDELINES FOR LINE-ORIENTED FLIGHT TRAINING, VOLUME 1
John K. Lauber and H. Clayton Foushee Aug. 1981 46 p refs Proceedings of NASA/Industry Workshop, Moffett Field, Calif., 13-15 Jan. 1981
(NASA-CP-2184; A-8585-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 01C

Line-Oriented Flight Training (LOFT) is a developing training technology which synthesizes high-fidelity aircraft simulation and high-fidelity line-operations simulation to provide realistic, dynamic pilot training in a simulated line environment. LOFT is an augmentation of existing pilot training which concentrates upon command, leadership, and resource management skills. This report, based on an NASA/Industry workshop held in January, 1981, is designed to serve as a handbook for LOFT users. In addition to providing background information, guidelines are presented for designing LOFT scenarios, conducting real-time LOFT operations, pilot debriefing, and instructor qualification and training. The final chapter addressed other uses of LOFT and line-operations (or full-mission) simulation. Author

N81-30102# BDM Corp., McLean, Va.
DEFINITION OF INVESTIGATIVE AREAS FOR HUMAN-FACTOR ASPECTS OF AIRCRAFT ACCIDENTS Final Report, 13 Mar. - 23 Dec. 1979
Michael Fineberg, John Woelfel, Robin Ely, and Marcia Smith Dec. 1980 130 p refs
(Contract F33615-79-C-0608; AF Proj. 2787)
(AD-A101601; BDM/W-79-733-TR; SAM-TR-80-48) Avail: NTIS HC A07/MF A01 CSCL 01/3

This paper is the final report of a 9-month survey effort designed to identify the major pilot factors involved in aircraft mishaps, rank order the major pilot factors in relation to a return-on-investment metric, identify aviation technologies with a high potential for diagnosing and/or reducing these pilot factors, and suggest potentially high-payoff programs for researching the pilot factor aspects of aircraft for the purpose of reducing their incidence. Author (GRA)

N81-30103# Federal Aviation Administration, Atlantic City, N.J.
AIRCRAFT RESEARCH AND TECHNOLOGY FOR ANTIMISTING KEROSENE CONFERENCE
Jun. 1981 260 p Proceedings held at Atlantic City, N.J. 18-19 Feb., 1981
(AD-A101347; FAA-CT-81-181) Avail: NTIS HC A12/MF A01 CSCL 01/2

Contents: Antimisting Fuel Engineering and Development Program, Wing Spillage Test, Flammability Comparison Test Apparatus, Large-Scale Aircraft Crash Test of Antimisting Fuel, The Use of Antimisting Kerosene in Turbofan Jet Engines, The Development of ICI'S FM-9 Antimisting Aviation Fuel, Cryogenic Blending Polymer Additives in Fuel, Economic Aspects of Conversion to Antimisting Fuels, UK Programme on Safety Fuels, Fundamental Studies of Antimisting Fuels, Degradation and Characterization of Antimisting Kerosene, Antimisting Fuel Test Correlation Analysis, and KS/DC-10 Fuel System Simulator. GRA

N81-30104# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
A COMPENDIUM OF AIRCRAFT COCKPIT VISION SURVEYS, 1950 THROUGH 1980, VOLUME 1 Final Report, 1950-1980
Anthony J. Barile May 1981 148 p refs
(AD-A101473; FAA-CT-81-40-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01/3

This publication contains a history of cockpit of visibility surveys which were conducted to measure and record aircraft (General Aviation, Transport, Helicopter, Military) cockpit visibility. Many of the aircraft were involved in midair collisions, accident investigations, research and development, and the design up through production implementation. The Federal Aviation Administration (FAA) Binocular Camera is a standard means to accurately measure cockpit visibility, which in the certification process for civil aircraft is an invaluable tool for industry and the FAA. Therefore, the information contained in this document is intended to contribute to aviation safety. Author (GRA)

N81-30105# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
APPLICATION OF DAMAGE TOLERANCE CONCEPTS FOR MBB HELICOPTERS
M. vonTapavicza and F. Och 12 Sep. 1980 11 p refs Presented at 51st AGARD Struct. and Mater. Panel on Helicopter Fatigue Life Assessment, Aix-en-Provence, France, 14-19 Sep. 1980
(MBB-UD-309/80-OE) Avail: NTIS HC A02/MF A01

Components were tested in order to determine the location and modes of damage, and to establish how many redundant elements can fail without adversely affecting the capacity of the equipment to withstand limiting loads. Maximum safety and performance are sought for minimum weight and costs. The time elapsing between the onsat of damage and the moment when failure occurs is determined from inspection tests. Probable lives are calculated from experimental S-N curves, the corresponding strength reduction factor being an important parameter. Damage tolerance is based on combined safe life and slow crack growth evaluations. The methodology adopted for two types of helicopter is presented. It is shown that safety criteria can be respected by applying stringent conditions to just a few vital components. These components are defined and some test results are given. Author (ESA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N81-30106*# Battelle Columbus Labs., Mountain View, Calif.
OPERATIONAL PROBLEMS EXPERIENCED BY SINGLE PILOTS IN INSTRUMENT METEOROLOGICAL CONDITIONS Interim Report
Stacy Weislogel 5 Aug. 1981 74 p refs
(Contract NAS2-10060)
(NASA-CR-166236) Avail: NTIS HC A04/MF A01 CSCL 17G

The development and implementation of a search strategy to extract pertinent reports from the Aviation Safety Reporting System-2 (ASRS-2) database are described. For any particular occurence to be pertinent to the study, it must have satisfied the following conditions: the aircraft must be of the type usually flown by a single pilot; operation on an IFR flight plan in instrument meteorological conditions; pilot experienced an operational problem. The occurances consist of reports by the pilot about his own performance, by the pilot about the system performance, or by an air traffic controller about a pilot's performance. T.M.

N81-30107# Mitre Corp., McLean, Va.
DISCRETE ADDRESS BEACON SYSTEM DATA LINK CAPACITY REQUIREMENTS Final Report
Anand D. Mundra Dec. 1980 124 p refs
(Contract DOT-FA80WAI-4370)
(AD-A101731; MTR-80W302; FAA-RD-81-56) Avail: NTIS HC A06/MF A01 CSCL 17/7

The Federal Aviation Administration plans to deploy the Discrete Address Beacon System (DABS) as a key feature of its upgraded third generation Air Traffic Control System. DABS provides an integral data link capable of conducting rapid transfer of data between the sensor and DABS equipped aircraft. This study establishes the performance requirements of the DABS data link to be able to provide the various services that may reasonably be expected to be delivered by DABS during its life time. GRA

N81-30108# Research Inst. of National Defence, Stockholm (Sweden). Dept. 3.
NOTES ON UNDERWATER ACOUSTIC NAVIGATION
Lars Goetherstroem Apr. 1981 65 p refs
(FOA-A-30026-E3) Avail: NTIS HC A04/MF A01

The microstructure and macrostructure of the underwater acoustic channel are described. Surface; bottom, and volume scattering are considered as well as the detection and estimation aspects of signal handling in navigation. The variance and bias of range and bearing estimates are discussed along with decision errors and position ambiguities. Geometrical considerations of establishing a position in a coordinate system and underwater communication are mentioned. Author (ESA)

N81-30109# Johns Hopkins Univ., Laurel, Md.
US COAST GUARD STUDY ON SOLAR POWERED AIDS TO NAVIGATION (SPAN)
W. E. Allen and J. E. Tarr Feb. 1981 107 p refs Sponsored in part by Coast Guard
(PB81-190233; JHU/APL-SR-81-3) Avail: NTIS HC A06/MF A01 CSCL 17G

This study evaluates a system using a secondary battery, recharged daily to the extent practicable by a photovoltaic solar panel mounted on the aid. Factors affecting performance of this system are discussed. Nickel cadmium and lead acid batteries are evaluated and compared as energy storage elements, considering such factors as cycle life, allowable depth of discharge, and cost. Candidate charge regulators are also evaluated. Included in this report is a discussion of areas requiring further research. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-30110*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE USE OF INTERPRACTIVE GRAPHIC DISPLAYS FOR INTERPRETATION OF SURFACE DESIGN PARAMETERS
Noel A. Talcott, Jr. May 1981 27 p refs
(NASA-TM-81963; L-14112) Avail: NTIS HC A03/MF A01 CSCL 01C

An interactive computer graphics technique known as the Graphic Display Data method has been developed to provide a convenient means for rapidly interpreting large amounts of surface design data. The display technique should prove valuable in such disciplines as aerodynamic analysis, structural analysis, and experimental data analysis. To demonstrate the system's features, an example is presented of the Graphic Data Display method used as an interpretive tool for radiation equilibrium temperature distributions over the surface of an aerodynamic vehicle. Color graphic displays were also examined as a logical extension of the technique to improve its clarity and to allow the presentation of greater detail in a single display. Author

N81-30111*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
COMPARISON OF THREE THRUST CALCULATION METHODS USING IN-FLIGHT THRUST DATA
Donald L. Hughes Jul. 1981 35 p refs
(NASA-TM-81360; H-1141) Avail: NTIS HC A03/MF A01 CSCL 01C

The gross thrust of an experimental airplane was determined by each method using the same flight maneuvers and generally the same data parameters. Coefficients determined from thrust stand calibrations for each of the three methods were then extrapolated to cruise flight conditions. The values of total aircraft gross thrust calculated by the three methods for cruise flight conditions agreed within + or - 3 percent. The disagreement in the values of thrust calculated by the different techniques manifested itself as a bias in the data. There was little scatter (0.5 percent) for the thrust levels examined in flight. T.M.

N81-30112*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BEHAVIOR OF AIRCRAFT ANTISKID BRAKING SYSTEMS ON DRY AND WET RUNWAY SURFACES: HYDROMECHANICALLY CONTROLLED SYSTEM
John A. Tanner, Sandy M. Stubbs, and Eunice G. Smith Aug. 1981 176 p refs
(NASA-TP-1877; L-14549) Avail: NTIS HC A09/MF A01 CSCL 01C

The investigation utilized one main gear wheel, brake, and tire assembly of a McDonnell Douglas DC-9 series 10 airplane. The landing-gear strut was replaced by a dynamometer. During maximum braking, average braking behavior indexes based upon brake pressure, brake torque, and drag-force friction coefficient developed by the antiskid system were generally higher on dry surfaces than on wet surfaces. The three braking behavior indexes gave similar results but should not be used interchangeably as a measure of the braking of this antiskid sytem. During the transition from a dry to a flooded surface under heavy braking, the wheel entered into a deep skid but the antiskid system reacted quickly by reducing brake pressure and performed normally during the remainder of the run on the flooded surface. The brake-pressure recovery following transition from a flooded to a dry surface was shown to be a function of the antiskid modulating orifice. T.M.

N81-30113# Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF HIGH-ANGLE-OF-ATTACK MANEUVER-LIMITING FACTORS. PART 1: ANALYSIS AND SIMULATION Final Report, 13 May 1976 - 30 Jul. 1980
Donald E. Johnston, David G. Mitchell, and Thomas T. Myers Dec. 1980 203 p refs

(Contract F33515-76-C-3072; AF Proj. 2403)
(AD-A101646; STI-TR-1081-1-Pt-1; AFWAL-TR-80-3141-Pt-1)
Avail: NTIS HC A10/MF A01 CSCL 01/3

The high angle of attack, low speed stall/departure characteristics of the F-4J and F-14A are analyzed, using a six degree of freedom mathematical model with nonlinear aerodynamics. Cause-effect relationships are investigated for maneuver limiting factors including wing rock, nose slice, and rolling departures. Cross derivatives of L alpha, N alpha, and M beta alter key transfer function parameters. A piloted simulation validates analytic predictions and demonstrate that departure warning, susceptibility, and severity are strongly influenced by the static cross derivatives. A connection between roll numerator parameter values and pilot perception of departure susceptibility and severity is identified. Potential modifications for the high AOA sections of the MIL-F-87858 Flyin Qualities Specifications are proposed: a criterion for the real part of the roll numerator root, further recommendations for minimizing departure susceptibility and certain sideslip influences, and a flying quality rating form for assessing departure and recovery characteristics. GRA

N81-30114# Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF HIGH-ANGLE-OF-ATTACK MANEUVER-LIMITING FACTORS. PART 2: PILOTED SIMULATION ASSESSMENT OF BIHRLE DEPARTURE CRITERIA Final Report, 13 May 1976 - 30 Jul. 1980
David G. Mitchell and Donald E. Johnston Dec. 1980 51 p refs
(Contract F33615-76-C-3072; AF Proj. 2403)
(AD-A101647; STI-TR-1081-1-Pt-2; AFWAL-TR-80-3141-Pt-2)
Avail: NTIS HC A04/MF A01 CSCL 01/3

Analytical prediction and piloted simulation results for a specific set of programmed control deflections are compared for the F-4J and F-14A aircraft. GRA

N81-30115# Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF HIGH-ANGLE-OF-ATTACK MANEUVER-LIMITING FACTORS. PART 3: APPENDICES, AERODYNAMIC MODELS Final Report, 13 May 1976 - 30 Jul. 1980
David G. Mitchell, Thomas T. Myers, Gary L. Teper, and Donald E. Johnston Dec. 1980 124 p refs
(Contract F33615-76-C-3072; AF Proj. 2403)
(AD-A101648; STI-TR-1081-1-Pt-3; AFWAL-TR-80-3141-Pt-3)
Avail: NTIS HC A06/MF A01 CSCL 01/3

Aerodynamic models employed in the F-4J and F-14A high angle of attack analysis and validation are presented as well as the equations of motion, aerodynamic models, and control system configurations, used in the piloted simulation. GRA

N81-30116# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
EXPERIMENTAL DEVELOPMENT OF AN ADVANCED CIRCULATION CONTROL WING SYSTEM FOR NAVY STOL AIRCRAFT Research and Development Report
J. H. Nichols, Jr., R. J. Englar, M. J. Harris, and G. G. Huson May 1981 19 p refs Presented at the AIAA Aerospace Sci. Meeting (19th), St. Louis, 12-15 Jan. 1981
(WF41421000)
(AD-A101309; DTNSRDC/AERO-1272; DTNSRDC-81/045; AIAA-Paper-81-0151) Avail: NTIS HC A02/MF A01 CSCL 20/4

An advanced high lift system is being developed which combines a Circulation Control Wing (CCW) with Upper Surface Blowing (USB) to produce significant lift for STOL operations by Navy aircraft. The concept uses circulation control to pneumatically deflect USB engine thrust and thus augment aerodynamic wind lift produced by the outboard CCW. Two series of wind tunnel investigations have confirmed significant thrust turning to angles near 160 deg, suggesting the possibility for a simple, highly effective STOL and thrust reverser system. Two dimensional investigations of reduced diameter CCW trailing edges suggest their application as a no-moving-parts high lift system with minimal cruise penalty. The paper presents these experimental results and summarizes the technology development progressing towards an advanced STOL aircraft. Author (GRA)

N81-30117# Kaman Aerospace Corp., Bloomfield, Conn.
MM&T: LOW COST PRODUCTION/INSTALLATION OF URETHANE LEADING EDGE GUARDS ON ROTOR BLADES Final Report, 23 Aug. 1979 - 9 Dec. 1980
M. L. White and A. I. Belbruno Jun. 1981 57 p
(Contract DAAK51-79-C-0024)
(AD-A101603; R-1627A; USAAVRADCOM-TR-81-D-10) Avail: NTIS HC A04/MF A01 CSCL 01/3

A process for a low cost production/installation of urethane leading edge guards for rotor blades was developed. A survey of manufacturers and literature was conducted for suitable erosion guard materials. Flow, bonding, and temperature characteristics of the selected material were determined. The feasibility of the process of molding a boot on a 4 foot section of blade was demonstrated. From the results obtained in the molding phase, the tool concept and design was refined and a tool was fabricated to mold an erosion boot on a full length blade. Four full scale leading edge erosion boots were formed, bonded, and inspected. The costs were compared to current production process. GRA

N81-30118# ARO, Inc., Arnold Air Force Station, Tenn.
ALCM PREFLIGHT-TEST THRUST UNCERTAINTY ANALYSIS Final Report, Jun. - Oct. 1979
B. D. Couch, W. O. Boals, and B. M. Bishop AEDC Jul. 1981 100 p refs
(AD-A101443; AEDC-TR-81-2) Avail: NTIS HC A05/MF A01 CSCL 21/5

Uncertainty analyses of the F107 engine in-flight net thrust data acquisition systems and data reduction equations were conducted for both the AGM-86B and the AGM-109 Air-Launched Cruise Missile (ALCM) systems in preparation for the competitive flyoff between these two missile systems. An analytical model was developed to integrate the uncertainty estimates of the engine and missile inlet performance, the flight missile instrumentation and telemetering systems, and the flight data recording and reduction systems. This model was also used to calculate uncertainty estimates for each of several different net thrust equations which were used as a guide to select the primary and backup thrust calculation methods for the subsequent ALCM competitive flyoff and to predict the error limits of the measured flight data. Author (GRA)

N81-30119# Army Aviation Engineering Flight Activity, Edwards AFB, Calif. Directorate for Development and Qualification.
AH-1 LIGHTWEIGHT AIRBORNE LAUNCHER JETTISON EVALUATION Final Report, Sep. - Nov. 1980
Larry B. Higgins and John D. Ottomeyer Apr. 1981 22 p refs
(AD-A101461; USAAEFA-79-03) Avail: NTIS HC A02/MF A01 CSCL 19/7

An AH-1S jettison evaluation was made of the M261 19-round M260 7-round pre-production Lightweight Airborne Launcher (LWL). Forty-one flights totaling 11.5 flight hours were flown. The jettison characteristics of separation distance, time to clear or LWL motions did not appear to be significantly influenced by airspeed, sideslip angle or rate of descent. Satisfactory jettison envelopes for the pre-production M260 and M261 LWL were defined statically, at a hover, and in pilot perceived coordinated level flight to an airspeed of V(H) and partial power and autorotational descent to an airspeed of V(maxglide). The M260 and M261 LWL met the separation criteria of AMCP 706-203. GRA

N81-30120# General Electric Co., Burlington, Vt. Armament and Electrical Systems Dept.
HIGH IMPULSE GUN AIRBORNE DEMONSTRATION. GAU-13/A WEAPON, FEED SYSTEM, GUN DRIVE AND ELECTRONIC CONTROLS Final Technical Report, 3 Aug. 1979 - 31 Oct. 1980
Edwin J. DePasqual May 1981 34 p refs
(Contract DAAK10-79-C-0267)
(AD-A101698; Rept-81APB521) Avail: NTIS HC A03/MF A01 CSCL 19/6

The HIGAD test bed described in this report consists of a four barrel, GAU-8/A class, 30-mm Gatling type weapon with associated feeder and dual rate drive, and a microprocessor-controlled, hydraulically-operated recoil attenuation system. This

recoil system is referred to as FORC (Force Optimized Recoil Control) and is used for the 360 shot-per-minute (spm) rate. A second recoil system is used for the higher rate of 720 spm. This system is a passive low force recoil system. Complete interface requirements were established through many joint meetings between General Electric, Honeywell, and ARRADCOM. The resulting test program has demonstrated flawless gun system performance in the HIGAD test bed. A total of 161 rounds were fired for set-up and checkout purposes at the General Electric Firing Range prior to delivery to ARRADCOM. At Rock Island, 972 rounds were accumulated on the gun system during evaluation of the FORC recoil system. GRA

N81-30121# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
BK 117: A NEW HELICOPTER THROUGH INTERNATIONAL COOPERATION
E. Weiland and I. Kagitomi (Kawasaki Heavy Industries, Gifu, Japan) 4 Sep. 1979 28 p Presented at 5th European Rotorcraft and Powered Lift Aircraft Forum, Amsterdam, 4-7 Sep. 1979
(MBB-UD-274/79-OE) Avail: NTIS HC A03/MF A01

The design of the BK-117 helicopter and the selection of the main parameters are discussed. Results of ground and flight testing are included. The BK-117 is an engine multipurpose helicopter equiped with AVCO-Lycoming LTS101 turboshaft engines with a 11 m four-bladed rotor of the rigid type. The maximum takeoff weight is 2800 kg and cruise speed is 265 km/h. A high degree of commonality with the BO-105 (from which it was developed) was sought. Author (ESA)

N81-30122# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Airplane Div.
STRUCTURAL OPTIMIZATION OF ADVANCED AIRCRAFT STRUCTURES
G. Schneider, H. Goedel, and O. Sensburg 11 Aug. 1980 15 p refs Presented at 12th ICAS Congress, Munich, 12-17 Oct. 1980
(MBB-S/PUB/32) Avail: NTIS HC A02/MF A01

The application of software systems for the automatic design of minimum weight structures (several elements) is described. The structural layout of a carbon fiber composite forward swept wing is depicted. It is shown that a structural optimization system can be very useful in the preliminary design of an aircraft, especially one divided into several modules (static load calculations; deformations and stress calculations by finite elements; static aeroelastics; weight calculations; unsteady aerodynamic forces; vibration calculations and flutter calculations) which can be used separately and independently. Cross checks can be performed, and postulated design goals can be achieved. The low divergence speed of forward swept wings can be increased sufficiently with zero or a small weight penalty. The system is suitable for future high performance aircraft. Author (ESA)

N81-30123# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
DEVELOPEMENT OF ANTIRESONANCE FORCE ISOLATORS FOR HELICOPTER VIBRATION REDUCTION
D. Braun 18 Aug. 1980 20 p refs Presented at 6th European Rotocraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980 Sponsored by Bundesministerium fuer Forschung und Technologie
(MBB-UD-305/80-OE) Avail: NTIS HC A02/MF A01

A conventional isolator with elastomeric pivots was developed and tested. This type of pivot was found to be the most suitable pendulum bearing. Another type of isolator of a simple wear resistant design provided with a passive hydraulic force generator was developed. It is completely symmetrical in structure and exhibits a very low degree of inherent damping. Accurate theoretical descriptions were established for both types of isolator, which are arranged at several points in different operating directions between the gearbox and fuselage. A uniaxial functional model was used to simulate the vertical motion of the helicopter. Good agreement is achieved between the theoretical and practical models. Quasi-static and dynamic life tests on the hydraulic version lead to the prediction of a service life of at least 2000 hours. Author (ESA)

N81-30124# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. VFW Technological Centre.
OPERATIONAL EXPERIENCE WITH ADHESIVE BONDED STRUCTURES
Rob J. Schliekelmann 1979 31 p refs
(FOK-BO-1235) Avail: NTIS HC A03/MF A01

Problem areas that require service, the principle causes of possible failures, and ways of achieving fully reliable bonded joints are discussed. Tables and diagrams detailing information received from airlines are given. With some exceptions, operational experience with honeycomb sandwich components is poor, but with metal-to-metal joints there is wide variation. The nature of the durability problems is such that causes of failure are identifiable and there is a good basis for improvement in bonded structures. Author (ESA)

N81-30125# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Helicopter and Transport Div.
HELICOPTER TECHNOLOGIES OF THE FUTURE
Kurt Pfleiderer 13 Oct. 1980 33 p Presented at Soc. of Automotive Engr., 1980
(MBB-UD-314/80-OE) Avail: NTIS HC A03/MF A01

An assessment of the future possibilities for the helicopter is presented, within the broad spectrum of all transport systems. Special attention is paid to weight reduction by extensive use of composites such as Kevlar fiber reinforced plastics. Crash resistance, ergonomic configuration optimization, aerodynamic improvements, vibration reduction, specific fuel consumption and noise reduction are discussed. Examples from the BO 105 and BK 117 helicopters are given. By the end of the century the helicopter is expected to reach the discussed development limits. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N81-30126# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF AN ONBOARD COMPUTER SYSTEM FOR AIRCRAFT M.S. Thesis - 16 Jul. 1980 [PROJECTO DE UM SISTEMA COMPUTADOR A BORDO DE AERONAVES]
Horacio Aragones Forjaz Feb 1981 310 p refs In PORTUGUESE. ENGLISH summary
(INPE-1999-TDL/041) Copyright. Avail: NTIS HC A14/MF A01

The development of a microcomputer-based flight instrument, primarily designed to be installed in 'Bandeirante' aircraft models EMB-110K1, EMB-110P1 and EMB-110P2 is described. The equipment is intended to reduce the pilot's work load by furnishing continuous information on adequate engine torque settings, which will insure extended operational life to the engines and significant fuel savings. A.R.H.

N81-30127# AiResearch Mfg. Co., Torrance, Calif.
CRASH SURVIVABLE FLIGHT DATA RECORDING SYSTEM STUDY Final Report
30 Jun. 1981 355 p
(Contract F33615-80-C-0135)
(AD-A101503; Rept-81-17693; ASD-TR-5011) Avail: NTIS HC A16/MF A01 CSCL 14/3

This study reviews the requirements and available technology for crash survivable flight data recording systems. Primary efforts relate to fighter/attack aircraft, with the A-10, F-15 and F-16 used as specific examples. Results include design and performance characteristics of recommended systems and an analysis showing a high cost-effectiveness for implementation of such a CSFDRS. GRA

N81-30128# Arinc Research Corp., Annapolis, Md.
DEVELOPMENT OF AVIONICS INSTALLATION INTERFACE STANDARDS

Stewart Bailey, Neil Sullivan, and Atso Savisaar Jun. 1981 220 p
(Contract F04606-79-G-0082; AF Proj. 2257)
(AD-A101423; Rept-2258-03-2-2477) Avail: NTIS HC A10/MF A01

This document reports on the development of avionics installation standards for the avionics bay and cockpit areas of military aircraft. The standards were being developed through a co-operative industry/government open forum series of meetings. This report covers the preparation for the first meeting and the results of industry/government participation in the open forum. The draft avionics bay standard and a strawman control and display unit standard are attachments to the report.

Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N81-30129*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ENTRAINMENT AND THRUST AUGMENTATION IN PULSATILE EJECTOR FLOWS
V. Sarohia, L. Bernal, and T. Bui 15 Aug. 1981 53 p refs Sponsored in part by Navy
(Contract NAS7-100)
(NASA-CR-164715; JPL-Pub-81-36) Avail: NTIS HC A04/MF A01 CSCL 21E

This study comprised direct thrust measurements, flow visualization by use of a spark shadowgraph technique, and mean and fluctuating velocity measurements with a pitot tube and linearized constant temperature hot-wire anemometry respectively. A gain in thrust of as much as 10 to 15% was observed for the pulsatile ejector flow as compared to the steady flow configuration. From the velocity profile measurements, it is concluded that this enhanced augmentation for pulsatile flow as compared to a nonpulsatile one was accomplished by a corresponding increased entrainment by the primary jet flow. It is also concluded that the augmentation and total entrainment by a constant area ejector critically depends upon the inlet geometry of the ejector. Experiments were performed to evaluate the influence of primary jet to ejector area ratio, ejector length, and presence of a diffuser on pulsatile ejector performance. T.M.

N81-30130*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROTOR WAKE CHARACTERISTICS RELEVANT TO ROTOR-STATOR INTERACTION NOISE GENERATION
Loretta M. Shaw and Joseph R. Balombin 1981 25 p refs Presented at 7th Acoustic Conf., Palo Alto, Calif., 5-7 Oct. 1981; Sponsored by AIAA
(NASA-TM-82703; E-984) Avail: NTIS HC A02/MF A01 CSCL 21E

Mean and turbulent wake properties at three axial locations behind the rotor of an aerodynamically loaded 1.2 pressure ratio fan were measured using a stationary cross film anemometer in an anechoic wind tunnel. Wake characteristics at four radial immersions across the duct at four different fan speeds were determined utilizing a signal enhancement technique. The shapes of the waveforms of the mean rotor relative and mean upwash velocities were shown to change significantly across the span of the blades. In addition, an increase in fan rotational speed caused an increase in the maximum wake turbulence intensity levels near the hub and tip. Spectral analysis was used to described the complex nature of the rotor wake. Author

N81-30131# Garrett Turbine Engine Co., Phoenix, Ariz.
SMALL TURBINE ENGINE AUGMENTOR. PHASE 1: PRELIMINARY DESIGN STUDIES OF AFTERBURNER AND DUCT-BURNER CONFIGURATIONS Interim Technical Report, 1 Aug. - 29 Oct. 1980
T. E. Kuhn, T. W. Bruce, and H. C. Mongia Mar. 1981 47 p refs
(Contract F33615-80-C-2001; AF Proj. 3066)
(AD-A101595; Rept-21-3805(01); AFWAL-TR-81-2008) Avail: NTIS HC A03/MF A01 CSCL 21/5

Several candidate afterburner and duct-burner concepts were evaluated. The evaluation procedure included assessing engine and augmentor performance when integrated with airframes and mission data available from ATCM potential contractors. From the candidates analyzed, two configurations were chosen for further design evaluation. Of the several augmentor concepts screened, the conventional flameholder with mixer-nozzle and the partial-swirl augmentor were determined to produce the highest combustion efficiency with the least impact on the size or performance of the core engine. These two designs were therefore selected for detail analysis. Two engines were evaluated for use in augmented cruise missiles. The lower-bypass-ratio engine was selected because of its smaller diameter, similarity to the Boeing ALCM-L engine, and greater suitability for augmentation. The effect of using JP-10 and RJ-6 fuels was predicted to be small, but carbon-slurry fuel will require extensive modifications to the fuel manifold. Author (GRA)

N81-30132# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
HIGH TEMPERATURE STRAIN GAGE SYSTEM FOR APPLICATION TO TURBINE ENGINE COMPONENTS Final Report, 15 Jun. 1976 - 15 Aug. 1980
R. A. Weise and J. H. Foster Jan. 1981 253 p refs
(Contract F33615-76-C-2075; AF Proj. 3066)
(AD-A101713; R80AEG388; AFWAL-TR-80-2126) Avail: NTIS HC A12/MF A01 CSCL 14/2

A three-phase program was completed to develop reliable, high temperature dynamic strain gage systems for application to turbine engine components operating to 1500 F. The strain gage element, intermediate leads and gage fabrication processes that evolved are used over the full temperature range; however, two different application techniques are required to achieve maximum fatigue strength to 1500 F. A composite-ceramic application design is recommended to 700 F. At higher temperatures, the all-FSA or Rokide design is preferred. Gage factor stabilization procedures were established. A strain gage reliability demonstration was conducted on an engine compressor and showed the composite-ceramic gage to have better reliability below 700 F. The report includes a detailed procedure of gage fabrication and application. Author (GRA)

N81-30133# Rolls-Royce Ltd., Derby (England).
PROGRAMMES FOR MILITARY ENGINES WITH COST OBJECTIVES
Claude Foure 1980 47 p Transl. into ENGLISH from French Conf. paper presented at AGARD Conf.
(PNR-90058; AGARD-LS-107; Trans-15261) Avail: NTIS HC A03/MF A01

Management techniques for military aircraft engine design, production and maintenance referred to cost objectives are discussed. Life cycle cost, engine reliability, direct operating cost, purchasing cost, and the relationship between technical and cost objectives are examined. The techniques for cost forecasting are reviewed. The type of organization suited to follow both technical and cost objectives is analyzed. A maintenance method called Individually Repaired Subassemblies is detailed. The maintenance studies done for the Larzac aircraft fleet are presented. The spectrometric analysis of oil, particle analysis, vibration analysis, gammagraphy and endoscopy as maintenance techniques are also discussed. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N81-30134*# Kansas Univ. Center for Research, Inc., Lawrence Flight Research Lab.

A PROGRAM TO EVALUATE A CONTROL SYSTEM BASED ON FEEDBACK OF AERODYNAMIC PRESSURE DIFFERENTIALS, PART 1 Interim Report
Ronald R. Hrabak, David W. Levy, Paul Finn, and Jan Roskam Aug. 1981 213 p refs
(Grant NAG4-5)
(NASA-CR-164684; KU-FRL-490-1-Pt-1) Avail: NTIS HC A10/MF A01 CSCL 01C

The use of pressure differentials in a flight control system was evaluated. The pressure profile around the test surface was determined using two techniques: (1) windtunnel data (actual); and (2) NASA/Langley Single Element Airfoil Computer Program (theoretical). The system designed to evaluate the concept of using pressure differentials is composed of a sensor drive and power amplifiers, actuator, position potentiometer, and a control surface. The characteristics (both desired and actual) of the system and each individual component were analyzed. The desired characteristics of the system as a whole are given. The flight control system developed, the testing procedures and data reduction methods used, and theoretical frequency response analysis are described. J.M.S.

N81-30135*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
A PROGRAM TO EVALUATE A CONTROL SYSTEM BASED ON FEEDBACK OF AERODYNAMIC PRESSURE DIFFERENTIALS. PART 2: DATA REPORT FOR PHASE 1 WIND TUNNEL TEST Interim Report
Ronald R. Hrabak, David W. Levy, Paul Finn, and Jan Roskam Aug. 1981 119 p refs
(Grant NAG4-5)
(NASA-CR-164685; KU-FRL-490-1-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 01C

Wind tunnel test data are presented. The purpose of the test was to determine the sensor location for sensitivity to flap deflection and to determine the range required of the sensor. The calculations followed to correct the raw pressure measurements, the corrected measurements, which represent the static pressures along the airfoil surface, and the static pressures tabulated and in coefficient form are described. However, the chordwise locations of the upper and lower surface taps do not coincide. An interpolation routine is performed to find the lower surface pressure coefficients at the upper surface tap locations. The difference, C sub P(lower) - C sub P(upper), is calculated and listed and the data are reorganized with respect to each tap location. A numerical regression performed to quantify the slopes of the graphs allows more accurate comparison of sensitivity and linearity. J.M.S.

N81-30136*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION STUDY OF TWO VTOL CONTROL/DISPLAY SYSTEMS IN IMC APPROACH AND LANDING
Vernon K. Merrick Aug. 1981 90 p refs
(NASA-TM-81295; A-8592) Avail: NTIS HC A05/MF A01 CSCL 01C

Both systems had full attitude command; the more complex system (Type 1) also had translational velocity command. The systems were applied to existing models of a VTOL lift-fan transport and the AV-8A Harrier. Simulated landings were made on a model of a DD963 Spruance-class destroyer. It was concluded that acceptable transitions and vertical landings can be performed, using the Type 1 system, in free-air turbulence up to 2.5 m/sec and sea state 6 and, using the Type 2 system, in free-air turbulence up to 1.5 m/sec and sea state 4. T.M.

N81-30137*# Vigyan Research Associates, Inc., Hampton, Va.
SUBSONIC PITCH-UP ALLEVIATION ON A 74 DEG DELTA WING
Dhanvada M. Rao and Thomas D. Johnson, Jr. (Kentron International, Inc., Hampton, Va.) Jul. 1981 20 p refs
(Contract NAS1-16259)
(NASA-CR-165749) Avail: NTIS HC A02/MF A01 CSCL 01C

Fixed leading-edge devices were investigated for alleviating the low speed pitch-up and longitudinal instability of a 74 deg delta wing model. In wind-tunnel tests, Pylon Vortex Generators were shown to be highly effective, compared to leading-edge fences and slots, in raising the pitch-up angle of attack from 8 deg to 28 deg. The subsonic drag penalty was negligible. Author

N81-30138*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Control Dynamics Branch.
A CONTINUOUSLY RECONFIGURING MULTI-MICROPROCESSOR FLIGHT CONTROL SYSTEM Final Report, 1 Aug. 1979 - 30 Apr. 1981
Stanley J. Larimer and Scott L. Maher May 1981 150 p refs
(AF Proj. 2403)
(AD-A101412; AFWAL-TR-81-3070) Avail: NTIS HC A07/MF A01 CSCL 09/2

Recent research at the US Air Force Wright Aeronautical Laboratories (Flight Dynamics Lab) has resulted in the development of a promising microprocessor-based flight control system design. This system is characterized by a collection of cooperatively autonomous distributed microcomputers interconnected by an arbitrary number of common serial multiplex busses. Each processor in the system independently determines its assignments using a simple algorithm that dynamically redistributes system functions from processor to processor in a never-ending process of reconfiguration. This approach offers several benefits in terms of system reliability, and the architecture in general incorporates many state-of-the-art features which promise improved system throughput, expandability, and above all, ease of programming. GRA

N81-30139# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehflueger.
FLIGHT INVESTIGATIONS OF A HELICOPTER LOW AIRSPEED ESTIMATION SYSTEM BASED ON MEASUREMENT OF CONTROL PARAMETERS
A. J. Faulkner and F. Buchner 11 Aug. 1980 23 p refs Presented at 6th European Rotocraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980
(MBB-UD-306/80-OE) Avail: NTIS HC A02/MF A01

An indirect method for estimating airspeed, particularly suitable for modern hingless-rotor helicopters, is described. Air-speed indication is useful since handling characteristics are primarily dependent on the rotor in-plane component. The theoretical analysis developed uses of an existing simplified analytical solution (not involving nonlinear effects) for rotor flapping and thrust equations. These equations are inverted and appropriate approximations made for second-order quantities. Equations are thus derived for the longitudinal and lateral aerodynamic velocity components. Experimental results obtained for trimmed and transient flight states are presented. A 16 bit processor was employed. Particular attention is given to the rotor down-wash model together with instrumentation and accuracy improvements obtainable. Author (ESA)

N81-30140# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehflueger.
PARAMETER IDENTIFICATION OF A HINGELESS ROTOR HELICOPTER IN FLIGHT CONDITIONS WITH INCREASED INSTABILITY
M. Kloster, J. Kaletka (DFVLR, Brunswick), and H. Schaeufele 1 Sep. 1980 24 p refs Presented at 6th European Rotocraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980
(MBB-UD-307/80-OE) Avail: NTIS HC A02/MF A01

Hover and flight at maximum speed were studied. Both flight conditions were performed with maximum weight and a mid center of gravity position. An attitude feedback control system was necessary because of the instability. A strapdown system was used for measurements. Closed loop stabilization was obtained with an onboard computer. The input signals of the unstabilized helicopter were optimized. Time and frequency calculations show that special input signals are needed for the closed loop system. A special distribution of the power spectrum leads to a quasi-optimized input signal. These signals were filtered with second order linear filters to suppress rotor dynamics, derivatives identified from flight tests (six degree of freedom rigid body

model) are compared with the results of nonlinear simulation and quasistatic theory. In general, agreement is good.
Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N81-30141# Naval Civil Engineering Lab., Port Hueneme, Calif.
RECYCLING OF PORTLAND CEMENT CONCRETE AIRPORT PAVEMENTS: A STATE-OF-THE-ART STUDY Final Report, Oct. 1979 - Sep. 1980
M. C. Hironaka, R. B. Brownie, and G. Y. Wu Apr. 1981 36 p refs
(Contract DOT-FA77WAI-704)
(AD-A101482; FAA-RD-81-5) Avail: NTIS HC A03/MF A01 CSCL 11/2

An investigation was performed to assess the state-of-the-art of recycling Portland cement concrete (PCC) airport pavements. Previous laboratory studies have shown that recycling of PCC pavements is technically and economically feasible. This has been demonstrated in airport reconstruction projects at Jacksonville International Airport (Florida), Love Field (Texas), and Coffeyville Municipal Airport (Kansas), where PCC was recycled into econocrete base and aggregate subbase, cement stabilized base, and part of the aggregate base course, respectively. Recycling of PCC for surface courses in airport pavement construction has not yet been performed, but this should also prove to be beneficial as has been experienced by the Iowa DOT and other state highway agencies who have recycled PCC for surface courses. Equipment for recycling PCC pavements is currently available in the construction industry; however, these, along with the technology of PCC recycling, could be improved substantially. Recommendations for specific improvements are therefore made. Author (GRA)

N81-30142# California Univ., Livermore. Lawrence Livermore Lab.
MODEL TESTING OF A 1-kG HIGH-EXPLOSIVE-CELL MAZE
C. M. Bacigalupi and W. A. Burton 1 Apr. 1981 63 p refs
(Contract W-7405-eng-48)
(UCRL-53125) Avail: NTIS HC A04/MF A01

Both 1/8 scale and 1/4 scale model tests were conducted to confirm maze design criteria as well as to determine the cell explosive weight limit based on an allowable 10 psi reflected shock pressure at the halfway maze doorway. Permissible areas were specified for handling high energy within the cell. The integrity of cube root scaling of the explosive charges detonated in the 1/8 scale model was verified by explosive testing in a comparable 1/4 scale model. Reflected shock pressures in the hallway adjacent to the maze and the effect of HE charge orientation were also investigated. DOE

N81-30143# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
DIGITAL DATA BASES FOR VISUAL AND RADAR SIMULATION
Barbara Diess 5 Sep. 1980 12 p refs
(MBB-UA-549/80-OE) Avail: NTIS HC A02/MF A01

Criteria for a relevant mathematical description of the a simplified real world are defined and a computerized interactive system is described for facilitating the generation of data bases for flight simulators with high performance characteristics. The automatic generation of digital visual and digital radar scenes requires continuous updating and upgrading. The implementation of a system using a Perkin/Elsser 8/32 with 1 M byte store, a floating point processor and array processor, and standard input and output units is described. A.R.H.

N81-30144# National Bureau of Standards, Washington, D.C. Electromagnetic Fields Div.
EVALUATION OF A REVERBERATION CHAMBER FACILITY FOR PERFORMING EM RADIATED FIELDS SUSCEPTIBILITY MEASUREMENTS
Myron L. Crawford Feb. 1981 43 p refs
(PB81-181257; NBSIR-81-1638) Avail: NTIS HC A03/MF A01 CSCL 14B

Measurement procedures and results for evaluation of a large 2.44m x 3.05m x 7.62 reverberating chamber facility in the frequency range (100-1000) MHz are described. This facility referred to as a translational electromagnetic environment chamber, 'TEMEC', is a mode tuned chamber developed for use in measuring electronic equipment susceptibility to EM radiated fields. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N81-30145* IIT Research Inst., Chicago, Ill.
SPACE PROCESSING OF CHALCOGENIDE GLASS Final Report, 7 Mar. 1977 - 30 Sep. 1978
R. F. Firestone and S. W. Schramm 31 Oct. 1978 39 p refs
(Contract NAS8-32388)
(NASA-CR-161834; IITRI-D6137) Avail: NTIS HC A03/MF A01 CSCL 22A

The technique of space processing for chalcogenide glass was developed. The process and equipment are described. Successful long term levitation of objects in a l-g environment was achieved. Glass beads 4 mm diameter were containerless melted and fused together. S.F.

N81-30146# Comision Nacional de Investigacion del Espacio, Madrid.
[SPACE RESEARCH ACTIVITIES IN SPAIN]
1980 56 p refs Presented at 23rd COSPAR Plenary Meeting, Budapest, 2-14 Jun. 1980 Original contains color illustrations
Avail: NTIS HC A04/MF A01

The scientific and technological programs are summarized and the activities of the Madrid Space Station outlined. Ozone measurements (EOLO experiment), ionospheric electron content determinations from Intasat, and neutral wind profiles are reported. Astrophysics and radioastronomy activities included green line airglow rocket experiments, ultraviolet photometry using satellite data, dual frequency interplanetary scintillation observations, studies of nebular structure, planetary and galactic radioastronomy, and quasar structure. Detection, propagation and chemical composition of cosmic rays were studied. Remote sensing activities are described. Participation in Spacelab microgravity experiments, sounding rocket development, solar energy research and the characterization of thin films and radiation converters are summarized. Author (ESA)

N81-30147# Societe Nationale Industrielle Aerospatiale, Paris (France). Div. Systems Balistiques et Spatiaux.
SNIAS AND SPACE TECHNOLOGIES
A. Dauguet 1980 11 p Presented at Exposition Tech. Intern., Seoul, 3-8 Nov. 1980; sponsored by EN KOR
(SNIAS-802-422-101) Avail: NTIS HC A02/MF A01

The activities of the Space Ballistics Systems Division of Aerospatiale are summarized. The systems subdivision, is responsible for the development of the Diamant Launch Vehicle, The Symphonie Satellite, and the Ariane launcher. The Les Mureaux Industrial Center is responsible for the integration of Ariane stages, and the Aquitaine Center, for assembly, inspection, and test firing of, ballistic missiles; construction and integration of power stages and re-entry vehicles; and for the manufacture of high performance composites. The Cannes Center is prime contactor for METEOSTAT and currently working on the INTELSAT V program. The programs for sea and silo launched missiles, and the advantages of the ARIANE launcher are reviewed. The activities of the subsidiary EUROSATELLITE are outlined, including the development of a wide range of materials for use in advanced technologies and systems. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N81-30148# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TIDALLY CAUSED PERTURBATIONS IN THE ORBITS OF ARTIFICIAL SATELLITES [PERTURBACAO NA ORBITA DE SATELLITES ARTIFICIAIS DEVIDO A MARES]
Hans-Ulrich Pilchowski Apr. 1981 17 p refs *In* PORTUGUESE; ENGLISH summary
(INPE-2033-RPE/290) Avail: NTIS HC A02/MF A01

A theoretical model for derivation of perturbations on the artificial satellites movement, due to tidal disturbing functions, is developed. Author

N81-30149# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ADAPTIVE ESTIMATION OF REAL TIME ORBITS OF LOW ALTITUDE ARTIFICIAL SATELLITES [ESTIMACAO ADAPTATIVA E EM TEMPO REAL DE ORBITAS DE SATELLITES ARTIFICIALS A BAIXA ALTITUDE]
Atair Rios Neto and Helio Koiti Kuga May 1981 14 p refs To be presented at COBEM 81, 6th Congr. Brasleiro de Engenharia Mecanica, Rio de Janeiro, 15-18 Dec. 1981 *In* PORTUGUESE; ENGLISH summary
(INPE-2088-RPE/318) Avail: NTIS HC A02/MF A01

The divergence of estimates with subsequent statistical inconsistency of associated errors is one of the major difficulties in artificial satellite orbit determination by filtering of observation data. In this paper, results are presented which show the elimination of the divergence problem in the case of real time estimation of low altitude artificial satellites orbits. To do so, the extended Kalman filter is used, combined with an adaptive technique for state-noise sequential estimation and with a method of dynamical model compensation. Author

N81-30150# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SIMULATION OF EARTH ORBITS AND OBSERVATIONS OF AN ARTIFICIAL SATELLITE [SIMULACAO DA ORBITA E DE OBSERVACOES DE UM SATELITE ARTIFICIAL AO REDOR DA TERRA]
Ricarda Negreiros dePaiva Dec. 1980 69 p refs In PORTUGUESE; ENGLISH summary Presented at the 31st Ann. Meeting of SBPC, 8-15 Jul. 1979, Fortaleza, CE
(INPE-1955-RPE/269) Avail: NTIS HC A04/MF A01

A numerical simulation of low orbits of Earth artificial satellites and of the data obtained in the tracking stations are presented. Test conditions are provided for orbit determination using statistical procedures, and any other procedure that needs data from a low altitude satellite. The mathematical model of the orbit includes the influence of the geopotencial up to J6, C44 and S44, luni-solar and atmospheric drag perturbations. The simulated data consist of range and range-rate. Author

N81-31083*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS) NAVIGATION WITH DSN RADIO METRIC DATA
J. Ellis *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 83-89 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N81-30151# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
PRESENT STATUS OF THE EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF THE TECHNICAL UNIVERSITY AT MUNICH (TUM) LAUNCHER
Eduard Igenbergs, Heribert Kuczera, Klaus Kaufman, and Bernd Schroeder Sep. 1980 15 p refs Presented at 31st Aeroballistic Range Assoc. Meeting, Pasadena, Calif., Oct. 1980 Sponsored by Deutsche Forschungsgemeinschaft
(TUM-RT-KB-80/4) Avail: NTIS HC A02/MF A01

Electromagnetic phenomena which occur during the operation of the plasma-particle accelerator were investigated. A theoretical model was developed and validated and used to investigate variations of significant parameters of the accelerator. These calculations led to higher projectile velocities. Limitations of the time of flight velocity measurement are discussed and two alternate methods for particle detection and velocity measurement are described. These are Doppler radar and laser detector and back-light photography. A.R.H.

N81-30152# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrtechnik.
A COMPACT ELECTROMAGNETIC ACCELERATOR
Eduard Igenbergs, Heribert Kuczera, and Peter Lell Sep. 1980 4 p refs Presented at 31st Aeroballistic Range Assoc. Meeting, Pasadena, Calif., Oct. 1980
(TUM-RT-KB-80/5) Avail: NTIS HC A02/MF A01

An electromagnetic pellet accelerator for the injection of glass beads into a plasma accelerator is used to simulate cometary dust for collection method development. The accelerator is described and a schematic diagram given. Its operational characteristics are summarized and its applications listed. The relative dust velocity ranges from a few meters per second to 200 m/s. The interaction of the dust particles with the target may be investigated under high vacuum and without any contamination. Author (ESA)

N81-30153# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
TELEMETRY, TRACKING AND COMMAND SYSTEM SIMULATOR. VOLUME 1: SIMULATION MODEL
P. G. Wright and J. C. Currie Paris ESA Sep. 1980 37 p refs 2 Vol.
(Contract ESTEC-3399/77)
(ESA-CR(P)-1422-Vol-1) Avail: NTIS HC A03/MF A01

Theoretical problems involved in the simulation of a satellite tracking telemetry and control system are discussed. To simulate the system the signal at any point is represented by a set of samples, of real baseband waveform or complex envelope in the time domain or of baseband or radiofrequency spectrum in the frequency domain. The fast Fourier transform is used to switch between domains. The simulation of phase locked loops is shown to require a closely sampled spectrum. The function of the interplex transmitter is described. Methods for extracting a timing reference with and without prior modulation by a clock waveform are shown. Phase correction techniques on the phase shift keying complex envelope to restore the nominal signal phases to + or - 90 deg are shown. Digital signals are put through either an integrate and dump circuit or a matched filter to enable optimal decoding. Viterbi decoder error analysis techniques are shown. Author (ESA)

N81-30154# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
TELEMETRY, TRACKING AND COMMAND SYSTEM SIMULATOR. VOLUME 2: USER'S MANUAL
P. G. Wright and J. C. Currie Paris ESA Sep. 1980 157 p refs 2 Vol.
(Contract ESTEC-3399/77)
(ESA-CR(P)-1422-Vol-2) Avail: NTIS HC A08/MF A01

A preprocessor program was written which interactively writes the data, because writing this data requires detailed knowledge of both MODSIM and the operation of the simulator. The use of the preprocessor program to set up simulations is described. The program is interactive, being command driven by 27 commands, which are mainly concerned with simulating a block of the TT&C system. The program interactively requests data for a selected command, summarizes the command at the

terminal and offers the option of changing the data. There is also an edit facility which allows the alteration of previous simulation runs. Typing is minimized by allowing all commands to be abbreviated, and there are QUIT facilities to abandon any command and a QUERY facility to remind the user of available commands. Author (ESA)

N81-31100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RELOCATION OF THE NETWORK DATA PROCESSING AREA
R. P. Hurt *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 235-238 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22D

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N81-30155 Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Space and Ballistic Systems Div.
PRESENT AND FUTURE OF THE DIRECT TELEVISION SATELLITE
Alexandre Dauguet 1980 7 p Presented at INTELCOM, Rio de Janeiro, 19-23 May 1980
(SNIAS-802-422-107) Avail: NTIS HC A02

Direct-to-home television satellite broadcasting systems already in operation, and probable future systems requirements, are reviewed. Because of the diversity of needs, from large areas with uneven population density to small areas with high population density, and consequent differences in ground reception systems, designs for the future will require a higher radiated power than is provided by present day television satellites. Principal specifications for the French and German programs, including major payload specifications, antenna configurations, service modules and power generation, are given. The development of the joint French-German program to the design of a family of direct TV satellites is described. Problems of antenna design and coverage areas are considered. Author (ESA)

N81-30156# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ESTIMATOR FOR DETERMINING THE ORBITS OF ARTIFICIAL SATELLITES, IN THE PRESENCE OF UNMODELED ACCELERATIONS, USING THE KS TRANSFORMATION M.S. Thesis - 22 Jul. 1980 [DETERMINACAO DE ORBITAS DE SATELITES ARTIFICIAIS ATRAVES DE UM ESTMADOR, NA PRESENCA DE ACELERACOES NAO-MODELADAS, USANDO A TRANSFORMACAO KS]
Ricardo Negreiros DePaiva Feb. 1981 132 p refs In PORTUGUESE; ENGLISH summary
(INPE-1998-TDL/040) Avail: NTIS HC A07/MF A01

An extended Kalman filter is used and the modeled dynaics is assumed to be given only by a two-body motion, treated in a parametric space, using the Kustaanheimo-Stiefel transformation, where an analytical solution is given, explicit in the parametric time. The unmodeled effects are approximated by a first order Gauss-Markov process in the transformed space, an included in the estimation procedure with the definition of an extended state. With this procedure, the use of a sophisticated satellite dynamical model and the numerical integration, needed in standard orbit estimation to propagate the orbit and the state error covariance matrix, are avoided. True orbits and topocentric trackin stations observations are simulated in a digital computer to test by comparison the quality of the estimated results. T.M.

N81-30157# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY AND DEVELOPMENT OF A THREE AXIS ACTIVE ATTITUDE CONTROL SYSTEM FOR ARTIFICIAL SATELLITES USING COLD GAS PNEUMATIC ACTUATORS AND REACTION WHEELS M.S. Thesis - 12 Dec. 1980 [ESTUDO E DESENVOLVIMENTO DE UM SISTEMA DE CONTROLE DE ATITUDE ATIVO EM TRES EIXOS PARA SATELLITES ARTIFICIAIS USANDO ATUADORES PNEUMATICOS A GAS FRIO E VOLANTES A REACAO]
Marcelo Lopes deOliveiraeSouza Feb. 1981 369 p refs In PORTUGUESE; ENGLISH summary
(INPE-2000-TDL/042) Avail: NTIS HC A16/MF A01

The basic mission and ACS are initially selected and adopted (with simplifications). The problem to be solved is then formulated, through the following steps: discussion; design (parameters choice or calculation); and simulation and checking of the ACS' performance. The solution is then presented in the following respective order: based on qualitative considerations existing in the available literature; according to criteria established, most of them, in this work; by the ACS' digital programming and comparison of the results obtained with the desired requirements and with the results of similar problems presented in the literature. T.M.

N81-30158# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ESTIMATION OF AERODYNAMIC FORCES ACTING ON EARTH SATELLITES, APPLICATION TO AN EXPERIMENTAL SATELLITE [ESTIMACAO DAS FORCAS AERODINAMICAS EM SATELITES TERRESTRES, APLICACAO A UM SATELITE EXPERIMENTAL]
Valdemir Carrara Nov. 1980 43 p refs In PORTUGUESE; ENGLISH summary
(INPE-1944-RPE/262) Avail: NTIS HC A03/MF A01

The forces acting on an artificial satellite are described. Computable expressions are written for them. A subroutine called DRAG, which estimates the forces due to aerodynamic drag acting on a satellite with a general shape, was written. The equations were derived from Boltzmann equation, with a Maxwellian distribution of velocity and using atmospheric parameters. S.F.

N81-30159# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. High-Speed Aero-Performance Branch.
HIGH ANGLE OF ATTACK MISSILE AERODYNAMIC AT MACH NUMBERS 0.30 TO 1.5 Final Report, Mar. 1974 - Apr. 1979
Valentine Dahlem, Jack I. Flaherty, Donald E. Shereda, and Christian E. G. Przirembe (Rutgers Univ., N.J.) Nov. 1980 330 p refs
(AF Proj. 2404)
(AD-A010210; AFWAL-TR-80-3070) Avail: NTIS HC A15/MF A01 CSCL 01/1

Wind tunnel tests of a smooth missile model with several interchangeable nose parts were conducted at subsonic through supersonic speeds at angles of attack from 0 to 180 degrees. Measurements of both surface pressures and total forces and moments were made at a variety of Mach numbers and Reynolds number combinations. Data were supplemented with wake flow field measurements of the impact pressure and flow direction at angles of attack where maximum induced side force was expected to occur. The important variables of the high angle of attack flow phenomena are numerated. The high angle of attack data are analyzed to deduce the vortex shedding location, the vortex strength, and the vortex paths in the wake. Discrete vortex theory is examined as a method which could be modified, based on experimental data, and used to predict the aerodynamic characteristics of missiles to greater accuracy. E.A.K.

N81-30160# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Engineering.
MAXIMUM INFORMATION TRAJECTORY FOR AN AIR TO AIR MISSILE INTERCEPT M.S. Thesis - Texas Univ. at Austin
Stephen Wendell Larson Dec. 1980 80 p refs
(AD-A101497; AFIT-CI-80-68T) Avail: NTIS HC A05/MF A01 CSCL 16/2

This thesis presents a method for finding the trajectory to complete an air-to-air missile intercept which maximizes information. This is accomplished by formulating a parameter optimization problem and using a penalty function-Lagrange multiplier method to solve for the optimal path. The performance index is the trace of the information matrix. This information

matrix is derived using an extended Kalman filter formulation, in cartesian coordinates, which makes state estimates based only on angle measurements. The trace operation on the information matrix is used because the trace and the integration operations commute allowing a scalar performance index. Further, reduction in the functional form of the performance index is achieved by weighing the information matrix by the inverse of the measurement power spectral density. This also avoids numerical difficulties near intercept. Author (GRA)

N81-30161# Hydra Corp., Vienna, Va.
SEA-BASED DEPLOYMENT OF FLOATING-LAUNCH MISSILES (NEAR-TERM AND FAR-TERM DESIGN CONCEPTS FOR SEA-BASED SURFACE MOBILE MX MISSILE DEPLOYMENT) Final Report, 15 Nov. - 15 Dec. 1980
John E. Draim 15 Dec. 1980 73 p
(Contract OTA-133-0830.0)
(AD-A101587; TR-102-80) Avail: NTIS HC A04/MF A01 CSCL 16/4

This report presents systems concept descriptions for sea-based MX missiles, using surface ships as transporters. Near-term (1985-1990) and far-term (1990-2000) systems are described. Floating-launch methods are proposed, using either encapsulated missiles or the simpler (bare) HYDRA-type vertical floating launch. Parameters described include: force composition, missile jettison techniques, port facilities, deployment areas, personnel requirements, system costs, vulnerability, countermeasures, and C3 considerations. Author (GRA)

N81-30162# Hydra Corp., Vienna, Va.
SEA-BASED DEPLOYMENT OF FLOATING-LAUNCH MISSILES. APPENDICES Final Report, 15 Nov. - 15 Dec. 1980
John E. Draim 15 Dec. 1980 23 p
(Contract OTA-133-0830.0)
(AD-A101588; TR-102-80-APP) Avail: NTIS HC A02/MF A01 CSCL 16/4

The basic report presents systems concepts descriptions for sea-based MX missiles, using surface ships as transporters. Near-term (1985-1990) and far-term (1990-2000) systems are described. Floating launch methods are proposed, using either encapsulated missiles or the simpler (bare) HYDRA-type vertical floating launch. Parameters described include: force composition, missile jettison techniques, port facilities, deployment areas, personnel requirements system costs, vulnerability, countermeasures, and C3 considerations. Appendices include containerships and surface effects ships (SES) data. Author (GRA)

N81-30163# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
HIGH INCIDENCE AERODYNAMICS OF MISSILES DURING LAUNCH PHASE
G. Gregoriou and H.-G. Knoche 8 Jan. 1980 12 p refs Sponsored by Deutsche Forschungsgemeinschaft (DFG)
(MBB-UA-523/80-OE) Avail: NTIS HC A02/MF A01

The aeromechanics of vertical launching was studied. Very high angles of attack are often encountered with modern missiles. Theoretical methods for the quantitative and qualitative qualification of the in-plane and out-of-plane forces along with moments occurring are presented. These methods take essential geometrical parameters into consideration. Wind tunnel measurements complete the theoretical results, in particular with regard to out-of-plane forces, moments, and the effect of Reynolds number, nose blunting and nose geometry. Complete flight path simulation proved the feasibility of the hypotheses adopted. Author (ESA)

N81-30164# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
EUROPEAN MISSILE AERODYNAMICS AND DEVELOPMENTS
G. Gregoriou 21 Apr. 1980 54 p refs Presented at Short Course on Missile Aerodyn., Tenn., 7-11 Apr. 1980
(MBB-UA-531/80-OE) Avail: NTIS HC A04/MF A01

The joint development of new generation missiles by many European countries not only minimizes the costs and the technological risks for each individual country, but also increases the degree of weapons systems standardization within NATO. Focal points of research in recent years include: (1) jet influence on the dispersion of artillery rockets; (2) problems associated with the vertical launch of missiles; and (3) air intakes of ramjets. These areas are examined with respect to their significance in missile design. Some characteristic theoretical and measurement results are given. A.R.H.

N81-30165# Societe Nationale Industrielle Aerospatiale, Paris (France).
SATELLITE TV BROADCAST CONCEPT
Luc Guillard 1980 17 p Presented at French Aerospace Week in Indonesia, Djakarta, 8-12 Dec. 1980
(SNIAS-802-422-110) Avail: NTIS HC A02/MF A01

Direct broadcast systems in use or under development are mentioned including CTS/Hermes, EKRAN, BSE, INSAT and the Luxembourg satellite. The Franco-German program is described. Satellites located at 19 deg W provide nominal coverage at 103 dBW/sqm. The uplink frequency band is 17.3 to 18.1 gHz and during the first phase of the program three of the five allocated channels are used. Modular design concepts are used, to facilitate adoption of the system by export markets. A communication module, antenna module, service module, and propulsion module are called for. Author (ESA)

N81-30166# Swedish Space Corp., Solna.
TELE-X: A SWEDISH EXPERIMENTAL TELECOMMUNICATIONS SATELLITE
P. Nobinder 27 Jan. 1981 4 p
(Q7-18) Avail: NTIS HC A02/MF A01

The program for developing TELE-X, including the timetable, is described and a technical summary given. Intended to be a multipurpose vehicle for experimental and preoperational activities, the satellite has such potential uses as include high-speed digital data communications, direct-to-home television broadcasting, radio propagation measurements in frequency bands for high speed data communications and teletype services to mobile stations. Author (ESA)

N81-30167# Logica Ltd., London (England).
STUDY OF SCAN GEOMETRY IMAGE CORRECTION FOR THE COASTAL OCEAN MONITORING SATELLITE SYSTEM
D. A. Robinson, P. Redstone, and W. Cormack Paris ESA 18 Sep. 1980 172 p refs
(Contract ESA-4270/80/F-CG(SC))
(Rept-44.3321; ESA-CR(P)-1432) Avail: NTIS HC A09/MF A01

Algorithms required to compute the ground coverage of a representative scan from several specified ocean color monitor (OCM) and imaging microwave radiometer (IMR) configurations were analyzed. A conceptual technique was developed which provides the capability of separating the component of the ground footprint due to the scanner configuration (scan pattern primitive) from the distortions due to the relative motion between the Earth's surface and satelllite during the scan time (Coriolis distortion factor). Scan patterns for the following OCM configurations computed using this analysis, all with and without derotator: (1) Rectilinear Scan; (2) Subconical Scan by mirror tilt; (3) Subconical Scan by axis tilt. The algorithm required to determine the intensity value held in the image data matrix corresponding to any arbitary point on the Earth's surface was derived. Author (ESA)

N81-30168# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
COASTAL OCEANS MONITORING SATELLITE SYSTEM (COMSS) SYSTEM EVALUATION STUDY Final Report
Paris ESA Jan. 1981 131 p refs
(Contract ESA-3632/78/F-CG(SC))
(ESS/SS-1035; ESA-CR(P)-1433) Avail: NTIS HC A07/MF A01

The individual sensors, launcher (Ariane) and platform are defined. Payloads A and B are described with emphasis on an ocean color monitor, imaging microwave radiometer, synthetic aperture radar and supporting units. Orbits and coverage, configuration options, power and mission profile and data handling are detailed. Satisfaction of payload power remains the most severe problem (for the power subsystem parameters considered) for payload A unless the operating duty cycles are restricted

which can be accommodated within the ARIANE shroud. Sufficient mass margin (over 100 kg) exists to allow the inclusion of additional small instruments. These have to operate infrequently or at very low average power to avoid further aggravating the power problem. Wideband type tape recorders (around 5-10 GB capacity) should be carried to provide reasonable orbit cover. For Payload B, the provisional scatterometer parameters (notably power and data) appear to be very demanding. Consequently, the duty cycles of operation of other instruments have to be severely restricted if the scatterometer operates frequently.
Author (ESA)

N81-31081*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 77-79 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N81-30169*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION OF ANTI-FREEZE VISCOSITY MODIFIER FOR POTENTIAL EXTERNAL TANK APPLICATIONS
Robert O. L. Lynn Apr. 1981 15 p refs
(NASA-TM-82431) Avail: NTIS HC A02/MF A01 CSCL 22B

Viscosity modifiers and gelling agents were evaluated in combination with ethylene glycol and dimethyl sulfoxide water eutectics. Pectin and agarose are found to gel these eutectics effectively in low concentration, but the anti-freeze protection afforded by these compositions is found to be marginal in simulations of the intended applications. Oxygen vent shutters and vertical metallic surfaces were simulated, with water supplied as a spray, dropwise, and by condensation from the air. T.M.

N81-30170*# Space Ordnance Systems, Inc., Canyon Country, Calif.
SLIDE RELEASE DEVICE Final Report
31 Mar. 1981 60 p
(Contract NAS9-16169)
(NASA-CR-161048; Rept-8745) Avail: NTIS HC A04/MF A01 CSCL 22B

A prototype release mechanism is discussed which is interchangeable with the existing orbiter/external tank separation bolt and offers reduced weight, shock, and cost. The components are reuseable. The unit takes maximum advantage of the shank diameter and installs in the monoball just as does the shear bolt, by threading in the completely assembled condition. Actuation is different, in that instead of axially breaking the shank by very high pressure (on the order of 60,000 psi) using a very large force (over 235, 000 pounds), this mechanism releases the shank by cross-axis movement against a lubricated surface. Once free, the shank is driven out of the monoball by an axially precompressed spring. Final weight can be as low as 30 pounds, and the cartridge contains less than one gram of powder. The components show no significant wear after eleven actuations under load. A.R.H.

N81-30171*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY'S SPACE SHUTTLE TECHNOLOGY: A BIBLIOGRAPHY
Gloria R. Champine Jul. 1981 67 p
(NASA-TM-78651) Avail: NTIS HC A04/MF A01 CSCL 22B

This bibliography documents most of the major publications, research reports, journal articles, presentations, and contractor reports, which have been published since the inception of the Space Shuttle Technology Task Group at the NASA Langley Research Center on July 11, 1969. This research work was performed in house by the Center staff or under contract, monitored by the Center staff. The report is arranged according to method of publication: (1) NASA Formal Reports; (2) Contractor Reports; and (3) Articles and Conferences. Disciplines covered are in the areas of aerothermodynamics, structures, dynamics and aeroelasticity, environmental, and materials. The publications are listed without abstracts for quick reference and planning. Author

N81-31082*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPACE SHUTTLE LAUNCH ERA SPACECRAFT INJECTION ERRORS AND DSN INITIAL ACQUISITION
A. R. Khatib, A. L. Berman, and J. A. Wackley *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 80-82 ref (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N81-30172*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 30/20 GHz EXPERIMENTAL COMMUNICATIONS SATELLITE SYSTEM
Joseph N. Sivo 1981 10 p refs Proposed for presentation at 1981 Natl. Telecommun. Conf., New Orleans, 29 Nov. - 3 Dec. 1981; sponsored by IEEE
(NASA-TM-82683; E-966) Avail: NTIS HC A02/MF A01 CSCL 22A

NASA is continuing to pursue an agressive satellite communications technology development program focused on the 30/20 GHz frequency band. A review of the program progress to date is presented. Included is a discussion of the technology program status as well as a description of the experimental system concept under study. Expected system performance characteristics together with spacecraft and payload configuration details including weight and power budget is presented. Overall program schedules of both the technology development and the flight system development are included. Author

N81-30173# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A 240 MHz FM TRANSMITTER FOR BALLOON TELEMETRY [TRANSMISSOR DE FM EN 240 MHZ PARA TELEMETRIA DE BALOES]
Wilton Jose Fleming May 1981 39 p refs In PORTUGUESE; ENGLISH summary
(INPE-2061-NTE/171) Avail: NTIS HC A03/MF A01

The development of an FM transmitter in the 240 MHz band for telemetry of stratospheric balloons is presented. Author

N81-30174# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CRITERIA FOR IMPLANTATION OF AN EARTH TELEMETRY INFRASTRUCTURE FOR STRATOSPHERIC BALLOON APPLICATIONS [CRITERIO PARA IMPLANTACAO DE INFRA-ESTRUTURA TELEMETRICA TERRESTRE PARA APLICACAO EM BALOES ESTRATOSFERICOS]
Rosemary Ceragioli Jan. 1981 33 p refs In PORTUGUESE; ENGLISH summary Presented at the 32nd Ann. Meeting of SBPC
(INPE-1991-RPE/284) Avail: NTIS HC A03/MF A01

A network of three telemetry stations - one fixed and two mobile is discussed. The fixed station was defined as the maintenance center of the network and the homologation as the center of the on board system. One of the mobile stations

is used for fast pre-flight tests in remote operations as well as for tracking purposes. The last station is used for the acquisition and recording data in a trajectory intermediate point. S.F.

N81-30175# Los Alamos Scientific Lab., N. Mex.
BIOTELEMETRY STUDIES ON ELK
Gary C. White Mar. 1981 26 p refs
(Contract W-7405-eng-36)
(LA-8529-NERP) Avail: NTIS HC A03/MF A01

The movements of Rocky Mountain elk (Cervus elaphus nelsoni) in the eastern Jemez Mountains in north-central New Mexico were studied. Thirty-six elk were trapped, marked, and released, and 30 animals were radio collared. The June 1977 la Mesa fire created a wintering habit that was used heavily by the radio collared elk. The 10-year-old clear cuts on Cerro del Medio on the Baca Land and Cattle Company property was used for calving and nursing areas. It was found that the radio collared elk used it in an early successional state, and they did not use areas at the Los Alamos National Laboratory where there was human activity. DOE

N81-31085*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF TRACKING PERFORMANCE OF THE MTDD COSTAS LOOP FOR UQPSK SIGNAL
Y. H. Park *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 96-108 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09F

N81-31086*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXPERIMENTAL RESULTS ON TRACKING PERFORMANCE OF THE MTDD COSTAS LOOP WITH UQPSK SIGNAL
Y. H. Park *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 109-115 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-30176 Rice Univ., Houston, Tex.
A SELF-CONSISTENT COMPUTER MODEL FOR THE SOLAR POWER SATELLITE-PLASMA INTERACTION Ph.D. Thesis
David Lyttleton Cooke 1981 118 p
Avail: Univ. Microfilms Order No. 8116950

A computer program (PANEL) was developed to model the solar power satellite (SPS)-plasma interaction by an iterative solution of the coupled Poisson and Vlasov equations. The program uses the inside-out method and a finite difference scheme to calculate densities and potentials at selected points on either a two or three dimensional grid. After some improvements, it was tested and used to model the plasma interaction of the MSFC/Rockwell design for the SPS. Those results are presented. Dissert. Abstr.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N81-30177# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
STUDY OF AN ATTITUDE ACQUISITION MEASUREMENT TECHNIQUE USING THE ESA STARMAPPER, PART 2 Final Report
P. T. L. M. vanWoerkom and F. J. Sonnenschein Paris ESA 1979 90 p refs
(Contract ESTEC-3625/78/NL-AK(SC))
(NLR-TR-79116-U-Pt-2; ESA-CR(P)-1430) Avail: NTIS HC A05/MF A01

The rotational motion of a spin stabilized spacecraft equipped with a V slit sun sensor and the X slit ESA starmapper is modeled. Given the measurements produced by sun sensor and starmapper, and assuming complete absence of an a priori attitude estimate, an estimate of the attitude motion of the spinning spacecraft is required. The estimation algorithm is described, together with details of its software implementation for CDC Cyber 72 computer. Sensor misalignments, external torques and nutation are assumed to be negligible. Simulations using pseudomeasurements (generated by a truth model) were carried out for a number of parameter cominations, including nutation, sensor misalignments, different spin rates, telemetry resolution, and spacecraft asymmetry. In all simulations the estimated spacecraft attitude (interpreted as the estimated angular momentum vector) differed from the true angular momentum vector with errors of no more than about one arcminute.
Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N81-30178* Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
ORBIT TRANSFER VEHICLE (OTV) ADVANCED EXPANDER CYCLE ENGINE POINT DESIGN STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
15 Mar. 1981 16 p refs 3 Vol.
(Contract NAS8-33567)
(NASA-CR-161831; FR-14615-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 21H

The objective of the study was to generate the system design of a performance-optimized, advanced LOX/hydrogen expander cycle space engine. The engine requirements are summarized, and the development and operational experience with the expander cycle RL10 engine were reviewed. The engine development program is outlined. T.M.

N81-30179* Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
ORBIT TRANSFER VEHICLE (OTV) ADVANCED EXPANDER CYCLE ENGINE POINT DESIGN STUDY, VOLUME 2 Final Technical Report
15 Mar. 1981 135 p refs 3 Vol.
(Contract NAS8-33567)
(NASA-CR-161832; FR-14615-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 21H

The engine requirements are emphasized and include: high specific impulse within a restricted installed length constraint, long life, multiple starts, different thrust levels, and man-rated reliability. The engine operating characteristics and the major component analytical design are summarized. T.M.

N81-30180* Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
ORBIT TRANSFER VEHICLE (OTV) ADVANCED EXPANDER CYCLE ENGINE POINT DESIGN STUDY. VOLUME 3: ENGINE DATA SUMMARY Final Report
15 Mar. 1981 49 p refs 3 Vol.
(Contract NAS8-33567)
(NASA-CR-161833; FR-14615-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 21H

The engine operating characteristics were examined. Inlet pressure effects, tank pressurization effects, steady-state specific impulse, and the steady-state cycle were studied. The propellant flow schematic and operating sequence are presented. Engine hardware drawings are included. T.M.

N81-30181*# IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF IMPROVED RHENIUM COATINGS FOR FLUORINE ENGINE THRUST CHAMBERS Final Report, Jun. 1980 - Jan. 1981
K. J. Barton, R. Yurkewycz, Y. Harada, and I. Daniels 30 Jun. 1981 35 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-955786)
(IITRI-M06079-6; JPL-9950573) Avail: NTIS HC A03/MF A01 CSCL 21H

Coating trials were undertaken to evaluate the application of rhenium to carbon-carbon composite sheet by plasma spraying. Optimum spray parameters and coating thickness were identified for production of coatings free from continuous defects and with adequate adherence to the substrate. A tungsten underlayer was not beneficial and possibly deracted from coating integrity. Stress calculations indicated that the proposed operating cycle of the rocket engine would not cause spalling of the rhenium coating. Calculations indicated that permeation of gases through the coating would not be significant during the expected life of the thrust chamber. The feasibility of applying rhenium coatings by laser melting was also studied. Poor wetting of the composite surface by the liquid rhenium precluded production of uniform coatings. Borate/carborate fluxes did not improve wetting characteristics. A.R.H.

N81-30182*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A CASE HISTORY OF TECHNOLOGY TRANSFER
Aug. 1981 28 p refs
(NASA-TM-82618; E-870) Avail: NTIS HC A03/MF A01 CSCL 21H

A sequence of events, occurring over the last 25 years, are described that chronicle the evolution of ion-bombardment electric propulsion technology. Emphasis is placed on the latter phases of this evolution, where special efforts were made to pave the way toward the use of this technology in operational space flight systems. These efforts consisted of a planned program to focus the technology toward its end applications and an organized process that was followed to transfer the technology from the research-technology NASA Center to the user-development NASA Center and its industry team. Major milestones in this evolution, which are described, include the development of thruster technology across a large size range, the successful completion of two space electric rocket tests, SERT I and SERT II, development of power-processing technology for electric propulsion, completion of a program to make the technology ready for flight system development, and finally the technology transfer events. Author

N81-30183# Engins Matra, Velizy (France). Automatism General Studies Dept.
ASSESSMENT OF THRUSTER PERFORMANCE. VOLUME 1: TECHNICAL REPORT Final Report
P. E. Bourg Paris ESA 22 May 1980 182 p refs 2 Vol. (Contract ESOC-3855/79)
(Rept-0065/DX60-Vol-1; ESA-CR(P)-1431-Vol-1) Avail: NTIS HC A09/MF A01

Algorithms were developed for use in computer programs for determination attitude and orbit control thruster performance for satellites under control of the European Space Operations Center. The impact of parameters such as temperature, pressure and aging on thruster behavior in pulsed as well as in continuous burn mode are analyzed. From analysis of ground tests results, some mathematical model structures are proposed, concerning mainly the pulse shape and its integrated effect on the space-craft (impulse bit). Analysis of satellite flight sequences, in spin and in 3 axes stabilized cases lead to a selection of four particular maneuvers for which data transmitted through telemetry allows identification algorithms to be applied. These include nutation motion, wheel unloading, spin axis reorientation and north-south station keeping. Author (ESA)

N81-30184# Engins Matra, Velizy (France). Automatism General Studies Dept.
ASSESSMENT OF THRUSTER PERFORMANCE. VOLUME 2: USER'S MANUAL Final Report
P. E. Bourg Paris ESA 22 May 1980 52 p 2 Vol.
(Rept-0065/DX60-Vol-2; ESA-CR(P)-1431-Vol-2) Avail: NTIS HC A04/MF A01

Programs for determining attitude and orbit control thruster performance are listed and explained for satellites under control of the European Space Operations Center. The FORTRAN Programs are provided for impulse bit identification, equivalent mean thruster torque identification, pulse shape coefficient identification and quasi steady state thrust identification. Subroutines are listed for updating the vector of searched parameters, calculating a cost function and its derivatives, filtering flight data, and for solving a system of linear symmetric equations. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N81-30185*# Oregon Graduate Center for Study and Research, Beaverton.
FABRICATION AND SURFACE CHARACTERIZATION OF COMPOSITE REFRACTORY COMPOUNDS SUITABLE FOR THERMIONIC CONVERTERS Annual Report, 1 Nov. 1979 - 31 Oct. 1980
P. R. Davis and L. W. Swanson Dec. 1980 110 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-955156)
(NASA-CR-164671; JPL-9950568) Avail: NTIS HC A06/MF A01 CSCL 11D

Thermal faceting was observed for the high index planes of LaB6. The (100), (110), and (111) planes were found to be the most thermodynamically stable faces in vacuum in a study of electrode materials for thermionic emitters. The properties of adsorbed carbon, cesium, and cesium-oxygen layers were investigated on LaB6 single crystal surfaces as well as on Zr/0/W(100) and W(100). Cesium was found to increase electron reflection near the collision threshold on LaB6(100) and W(100) and to decrease the reflection on Zr/0/W(100). This difference may be explained by the unusually high threshold reflection coefficient of Zr/0/W without adsorbed cesium. A.R.H.

N81-30186*# Lockheed-California Co., Burbank.
FLIGHT SERVICE EVALUATION OF KEVLAR-49 EPOXY COMPOSITE PANELS IN WIDE-BODIED COMMERCIAL TRANSPORT AIRCRAFT: FLIGHT SERVICE REPORT Annual Report, Jan. - Dec. 1980
Robert H. Stone Apr. 1981 29 p refs
(Contract NAS1-11621)
(NASA-CR-165733; AR-7) Avail: NTIS HC A03/MF A01 CSCL 11D

Kevlar-49 fairing panels, installed as flight service components on three L-1011s, were inspected after 7 years service. There are six Kevlar-49 panels on each aircraft: a left hand and right hand set of a wing-body sandwich fairing; a slid laminate under-wing fillet panel; and a 422 K service aft engine fairing. The three L-1011s include one each in service with Eastern, Air Canada, and TWA. The fairings have accumulated a total of 52,500 hours, with one ship set having 17,700 hours service. The inspections were conducted at the airlines' major maintenance bases with the participation of Lockheed Engineering. The

Kevlar-49 components were found to be performing satisfactorily in service with no major problems or any condition requiring corrective action. The only defects noted were minor impact damage and a minor degree of fastener hole fraying and elongation. These are for the most part comparable to damage noted on fiberglass fairings. The service history to date indicates that Kevlar-49 epoxy composite materials have satisfactory service characteristics for use in aircraft secondary structure. Author

N81-30187*# Kansas Univ. Center for Research, Inc., Lawrence.
STATISTICAL DISTRIBUTION OF MECHANICAL PROPERTIES FOR THREE GRAPHITE-EPOXY MATERIAL SYSTEMS Final Report, Jul. 1976 - Jul. 1980
Charles Reese and James Sorem, Jr. Hampton, Va. NASA. Langley Research Center Jul. 1981 229 p refs
(Grant NsG-1281)
(NASA-CR-165736) Avail: NTIS HC A11/MF A01 CSCL 11D

Graphite-epoxy composites are playing an increasing role as viable alternative materials in structural applications necessitating thorough investigation into the predictability and reproducibility of their material strength properties. This investigation was concerned with tension, compression, and short beam shear coupon testing of large samples from three different material suppliers to determine their statistical strength behavior. Statistical results indicate that a two Parameter Weibull distribution model provides better overall characterization of material behavior for the graphite-epoxy systems tested than does the standard Normal distribution model that is employed for most design work. While either a Weibull or Normal distribution model provides adequate predictions for average strength values, the Weibull model provides better characterization in the lower tail region where the predictions are of maximum design interest. The two sets of the same material were found to have essentially the same material properties, and indicate that repeatability can be achieved. Author

N81-30188# Executive Office of the President, Washington, D.C Office of Science and Technology Policy
CARBON/GRAPHITE COMPOSITE MATERIAL STUDY Annual Report
15 Jan 1981 122 p refs
(AR-3) Avail: NTIS HC A06/MF A01

A coordinated federal government action plan was announced in January 1978 to study the potential problems arising from the projected increased use of carbon fiber composite materials in civilian applications. The primary concern was the electrical hazard associated with carbon fibers released from burning of carbon fiber composites and disposal of carbon composite waste or worn out parts. The federal government action plan assigned responsibility for various elements of the study to appropriate federal agencies. The third annual report of the Office of Technology Policy (OSTP) contains the final reports of the NASA, DOT, DOE, AND DOC and the progress reports of the EPA, DHHS (NIOSH), DOL (OSHA), and the FEMA. Also included in this report are the findings of the OSTP, the status agency responsibilities, and a list of applicable references. For individual titles, see N81-30189 through N81-30191.

N81-30189*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CARBON/GRAPHITE COMPOSITE MATERIAL STUDY. 3: AGENCY PROGRAM ACTIVITIES. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
In Executive Office of the President Carbon/Graphite Composite Material Study 15 Jan. 1981 p 6-10 (For primary document see N81-30188 21-24)
Avail: NTIS HC A06/MF A01 CSCL 11D

The accidental release of carbon fibers from civil aircraft and the need for protection of civil aircraft systems from such fibers were studied. It was concluded that the electrical hazard from carbon fibers accidentally released in an aircraft crash fire pose no threat to human life. Overall costs associated with carbon fiber release are predicted to be extremely low. The risk of electrical or electronic failures due to carbon fibers is so minimal that future exploitation of carbon composites in aircraft should be continued. Additional protection of aircraft avionics to guard against carbon fibers is unnecessary. A program to develop alternate materials specifically to overcome the potential electrical hazard is not justified. E.K.

N81-30190*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CARBON/GRAPHITE COMPOSITE MATERIAL STUDY, APPENDIX A AND APPENDIX B
In Executive Office of the President Carbon/Graphite Composite Material Study 15 Jan. 1981 p 48-100 (For primary document see N81-30188 21-24)
Avail: NTIS HC A06/MF A01 CSCL 11D

A comprehensive assessment of the possible damage to electrical and electronic equipment caused by accidental release of carbon fibers from burning civil aircraft with carbon composite parts was completed. The study concluded that the amount of fiber likely to be released is much lower than initially predicted. Carbon fiber released from an aircraft crash fire was found (from atmospheric dissemination models) to disperse over a much larger area than originally estimated, with correspondingly lower fiber concentrations. Long term redissemination of fiber was shown to be insigificant if reasonable care is exercised in accident cleanup. The vulnerability of electrical equipment to structural fibers in current use was low. Consumer appliances, industrial electronics, and avionics were essentially invulnerable to carbon fibers. Shock hazards (and thus potential injury or death) were found to be extremely unlikely. E.K.

N81-30191*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CARBON/GRAPHITE COMPOSITE MATERIAL STUDY. APPENDIX C: NASA STUDIES ON MODIFICATION OF CARBON/GRAPHITE FIBERS AND ALTERNATIVE MATERIALS
In Executive Office of the President Carbon/Graphite Composite Material Study 15 Jan. 1981 p 101-105 (For primary document see N81-30188 21-24)
Avail: NTIS HC A06/MF A01 CSCL 11D

The feasibility of modifying resin matrix composites to reduce the potential of electrical shorting from fire released fiber was explored. The effort included modifications to or coatings for graphite fibers, alternative fibers, modifications to matrix materials, and hybrid composites. The objectives included reduction of the conductivity of the graphite fiber, char formation to reduce fiber release, glass formation to prevent fiber release, catalysis to assure fiber consumption in a fire, and replacement of the graphite fibers with nonconductive fibers of similar mechanical potential. E.K.

N81-30192# Materials Sciences Corp., Blue Bell, Pa.
STUDY OF GRAPHITE/EPOXY COMPOSITES FOR MATERIAL FLAW CRITICALITY Final Report, 18 May 1979 - 31 Oct. 1980
S. N. Chatterjee and R. B. Pipes Nov. 1980 146 p refs
(Contract N62269-79-C-0209)
(AD-A101492; MSC/TFR/1106/1103; NADC-78241-60) Avail: NTIS HC A07/MF A01 CSCL 11/4

Usefulness of NDE methodology for assessing criticality of disbonds with two-dimensidnal planforms located in laminated graphite/epoxy composites has been examined. Linear elastic fracture mechanics approach, semi-empirical growth laws and methods of stress analysis based on a modified laminated plate theory have been studied for assessing growth rates of disbonds in a transverse shear environment. Elastic stability analysis has been utilized for laminates with disbonds subjected to in-plane compression and/or shear. Results of nondestructive inspections and destructive tests have been correlated with analytical predictions. In addition, effects of moisture conditioning and cyclic loading on wave velocities and attenuation of sound in graphite epoxy composites and in neat resin samples have been studied. Author (GRA)

N81-30193# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
DEVELOPMENT OF BORIDE COMPOSITE MATERIALS FOR COLD CATHODE DEVICES Final Technical Report, 10 Jan. 1979 - 10 Feb. 1980
John W. Goodrum May 1981 126 p refs
(Contract F19628-79-C-0048)

(AD-A101703; EES/GIT/A-2303; RADC-TR-81-92) Avail: NTIS HC A07/MF A01 CSCL 09/1

This report documents the results of a study to identify and develop binary and pseudobinary boride systems which would produce uniform arrays of metal boride needle crystals in parallel alignment by application of directional solidification. Evidence of aligned needle microstructure was observed in the systems LaB6-B, Fe2B-Fe, LaB6-Cu, TiB2-Ni and LaB6-Ni. Since much of the effort was expended on development of suitable preparation and analysis techniques further developmental work is recommended to bring the most promising systems to the point where test specimens could be produced. The LaB6-B eutectic shows greatest promise, followed by LaB6-Ni and LaB6-Cu, as potentially useful composite field emission cathode material. Author (GRA)

N81-30194# General Atomic Co., San Diego, Calif
STRENGTH OF NONUNIFORMLY OXIDIZED PGX GRAPHITE
R. J. Price and L. A. Beaver May 1981 39 p refs
(Contract DE-AT03-76ET-35301; Gen. Atomic Proj. 7400)
(GA-A-16270) Avail: NTIS HC A03/MF A01

Flexural and tensile tests were performed on PGX graphite oxidized to produce a steep surface oxidation gradient. Companion tensile specimens were oxidized under different conditions to produce uniform oxidation throughout the specimen, and their tensile strength and Young's modulus were measured. The flexural strength, flexural elastic modulus, and tensile strength were reduced much less by surface oxidation than by uniform oxidation. The test data were in good agreement with a simple linear elastic model in which Young's modulus at any point is a function of oxidation burnoff, and the strain at failure is independent of oxidation. The unoxidized interior of the specimens appears unaffected by the surface burnoff and remains able to fulfill its load bearing function. DOE

N81-30195# Little (Arthur D.), Inc., Cambridge, Mass.
DEVELOPMENT OF ADVANCED INSULATION FOR APPLIANCES, TASK 1 REPORT
F. E. Ruccia Jun. 1981 141 p refs
(Contract W-7405-eng-26)
(ORNL/Sub-81/13800/1) Avail: NTIS HC A07/MF A01

Efforts to develop advanced insulation concepts for residential and commercial water heaters, refrigerators, freezers, and ovens are discussed. The threshold target for these insulations is a thermal resistance for a 1-in. thickness of 20 hr sq ft degrees F/Btu. The program should also provide a path to commercialization of these new concepts. The general approach involved two basic steps to produce the data which could be used to evaluate the technical and economic feasibility of different insulation systems. First, the energy savings which could be obtained by significantly improving the insulation used in present day appliances were evaluated. Second, a number of different advanced insulation systems were evaluated conceptually to estimate the R/in values that could be achieved. This included both evacuated and nonevacuated systems. Finally, results of these two analyses were compared to identify the more promising systems for further development. DOE

N81-30196# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
CONCRETE-POLYMER COMPOSITES: CURRENT STATUS AND FUTURE RESEARCH NEEDS
Lawrence E. Kukacka Apr. 1981 14 p refs Presented at the Intern. Symp. Plastics in Mater. and Struct. Eng., Prague, 23-25 Jun. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29501; CONF-810653-1) Avail: NTIS HC A02/MF A01

The types of polymers that can be used to form concrete polymer materials are discussed. An overview of research and unsolved problems with the various classes of the materials is provided. The general state-of-the-art is described, principal areas of research are illustrated with typical examples, and areas needing further research are suggested. R.C.T.

N81-30197# California Univ., Livermore. Lawrence Livermore Lab.
CHARACTERIZATION OF HIGH PERFORMANCE COMPOSITE MATRICES
R. J. Morgan 5 Jun 1981 9 p refs Presented at the NSF/CNR Symp. Composite Mater. The Role of the Polymeric Matrix on the Process. and Struct. Properties, Capri, Italy, 15-19 Jun. 1981
(Contract W-7405-eng-48)
(UCRL-85765; CONF-810661-1) Avail: NTIS HC A02/MF A01

To predict the durability of a composite in service environment requires a basic understanding of (1) the role the matrix and its interface with the fibers play in the composite deformation and failure processes, (2) the relations between the structure, deformation and failure processes, and mechanical response of the matrix and (3) how such phenomena are modified by environmental factors. These areas are being studied. The fundamental areas of the structure-property relations of composite matrices that are necessary for making meaningful durability predictions are reviewed. These areas include the chemical and physical structure of epoxies and their modes of deformation and failure. DOE

N81-30198# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
DEVELOPMENT AND DESIGN OF A LARGE WIND-TURBINE BLADE
Michael Hahn May 1980 26 p refs
(MBB-UD-301/80-OE) Avail: NTIS HC A03/MF A01

The implementation of the mold concept in the fabrication of large blade-structures which require special surface definition and design features is described. These blades are intended for large horizontal axis windmills. Fiber reinforced composite materials produce rotor blades of high aerodynamic quality with very different profiles. It is possible to vary the stiffness of a cross-section with a given contour. Lightning protection features incorporated are described together with the protection characteristics afforded by erosion resistant paint. In the attachment area, the laminate is thickened considerably. The loads are transferred by means of prestressed studs in combination with cylindrical nuts which fit into holes bored in the thickened laminate. Author (ESA)

N81-30199# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
DEVELOPMENT OF A BEARINGLESS HELICOPTER TAIL ROTOR
H. Huber, H. Frommlet, and W. Buchs 11 Aug. 1980 24 p refs Presented at 6th European Rotocraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980
(MBB-UD-304/80-OE) Avail: NTIS HC A02/MF A01

A composite bearingless tail rotor is discussed which uses fiberglass bending-torsion-flexure to accommodate bending deflections and collective pitch control. The low chordwise stiffness (soft-inplane concept) contributes significantly to low blade stresses, attainment of low control loads, and low weight. The stability of the soft-inplane tailrotor coupled with the airframe modes is emphasized. Two tailrotor configurations, one three-bladed and the other four-bladed, are considered. The technical design approach is discussed as well as the dynamic characteristics, aerolastic stability, loads, and stress concentration. Results of the structural fatigue and frequency survey testing of components and full-scale blade assemblies are included. Expected weight and cost benefits are examined. Author (ESA)

N81-30200# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
LOW TEMPERATURE PROPERTIES OF CARBON FIBER REINFORCED EPOXIES
Walter Weiss 1 Aug. 1980 28 p refs Presented at Intern. Cryogenic Mater. Conf. on Nonmetal. Mater. and Composites at Low Temp., Geneva, 4-5 Aug. 1980
(MBB-UD-310/80-OE) Avail: NTIS HC A03/MF A01

The mechanical and thermal properties of carbon fiber reinforced composites were investigated. The values obtained are given. The development of test procedures, test specimens, and test equipment is described. The experimentally measured parameters are used to design highly loaded composite structures. The static and dynamic behavior of a typical load introduction element is presented for several configurations with different

fibers. The materials tested exhibited good static and dynamic load resistance. Tests on glass, carbon, and aramid composites indicated a remarkable increase in fatigue life at low temperatures. Author (ESA)

N81-30201# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
FABRICATION AND PROPERTIES OF HIGH DENSITY CARBON-CARBON COMPOSITES [ELABORATION ET PROPRIETES DES COMPOSITES CARBONE-CARBONE A HAUTE DENSITE]
J. P. Slonina (Le Carbone Lorraine) and H. Girard 1980 5 p In FRENCH; ENGLISH summary Presented at 3rd Intern. Congr. on Carbon Carbone 80, Baden-Baden, West Germany, 30 Jun. - 4 Jul. 1980
(SNIAS-802-422-105) Avail: NTIS HC A02/MF A01

The development of a chemical vapor depositon techniques for an axisymmetrical substrate having three carbon fiber directions in one plane and one perpendicular to it is considered. The Aerolor 40 composite is obtained with standard textile procedures from unidirectional fiber layers before oxidation, following three main orientations. The density varies between 0.3 and 0.6 gr/cu cm. Aeroclor 41 has a density between 1.6 and 1.8 gr/cu cm and density increase is obtained by chemical deposit during vapor phase (thermal cracking of gaseous hydrocarbons) or by thermal cracking during liquid phase. By thermo forging at temperature on the order of 3000 C, high density Aerolor 41 is obtained (1.9 to 2.0 gr/cu cm). This temperature is reached by passing an electrical current through the material. The thermomechanical properties of these composites allow for applications where polycrystalline graphite is not acceptable. Author (ESA)

N81-30202# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
A FINITE-ELEMENT ANALYSIS OF BIMODULUS COMPOSITE PLATES AND SHELLS
J. N. Reddy Mar. 1981 17 p refs Presented at the 9th Intern. Congr. on the Application of Math. in Eng. Weimar, East Germany, 28 Jun. - 5 Jul. 1981
(PB81-191686; VPI-E-81-7) Avail: NTIS HC A02/MF A01 CSCL 11D

Bending and vibration analyses of bimodulus plates are discussed. Finite element solutions for boundary conditions and loadings which do not admit closed form solutions are presented. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N81-30203 Illinois Univ. at Urbana-Champaign.
THE CATALYTIC BEHAVIOR OF SUPPORTED RUTHENIUM CLUSTER COMPOUNDS Ph.D. Thesis
Virgil Lynn Payne 1981 110 p
Avail: Univ. Microfilms Order No. 8114457

The preparation, catalytic behavior and characterization of supported metal particles derived from Ru3(CO)12 and Ru 6 CO14C7 He are described. These clusters were dispersed in very low concentration on high surface area alumina and silica and low area titania. Using the hydrogenolysis/dehydrogenation of n-butane as a diagnostic tool, it was observed that the catalytic behavior depends on the particular cluster as well as the pretreatment conditions and the support. There were no dramatic differences between the activities of the supported clusters. Physical charaterization of the catalysts using hydrogen and carbon monoxide chemisorption revealed an uptake of less than 0.2 hydrogen atoms per ruthenium atom, and an average CO uptake of one molecule per ruthenium atom. The evidence suggests that decarbonylation and activation of the compounds gives rise to catalytically active species which interact strongly with the support, perhaps leading to oxidation of the metal. The observed product distributions suggest an increase in the extent of cracking of the butane molecule as the nuclearity of the initial cluster compound increases. This further suggests some retention of structure of the original cluster, even under severe catalytic conditions. Dissert. Abstr.

N81-30204 Illinois Univ. at Urbana-Champaign.
PROPERTIES OF BIMETALLIC CATALYSTS PREPARED FROM ALUMINA SUPPORTED MIXED METAL CLUSTERS Ph.D. Thesis
Steven John Hardwick 1981 198 p
Avail: Univ. Microfilms Order No. 8114431

The decarbonylation of mixed metal carbonyl clusters as a method of preparing highly dispersed crystallites of well defined size and stoichiometry is described. Hydrogenation of ethene was investigated over a series of alumina supported iron-ruthenium mixed metal carbonyls. The catalytic activities of the mixed metal carbonyls were approximately what one would expect from their additive behavior. A series of complexes, supported on alumina were also investigated. During activation in hydrogen most of the carbonyl ligands were hydrogenated to form methane. Studies employing catalytic methanation of carbon monoxide showed that all three clusters had similar activity, selectivity and activation energies. Very small supported bimetallic crystallites were prepared on alumina and their activity investigated. Dissert. Abstr.

N81-30205 North Carolina Univ. at Chapel Hill.
SOME EMITTER SURFACE MODIFICATIONS IN FIELD IONIZATION AND FIELD DESORPTION MASS SPECTROMETRY Ph.D. Thesis
Tim Lee Youngless 1980 151 p
Avail: Univ. Microfilms Order No. 8114878

Selective ionization or enhancement of certain sample molecules to obtain an increase in both sensivity and structural information was investigated. Procedures for obtaining field ionization (FI) and field desorption (FD) spectra on a mass spectrometer modified for FI and FD mass spectrometry are given. Methods for preparing cobalt, copper, and molybdenum dendrites are discussed. Methods and procedures for increasing the sensitivity of the emitter reveal that maximum sensitivity is obtained only when the emitter is activated in the mass spectrometer. Lithiation from coated cobalt emitters in the FI mode is compared with lithiation from coated bare tungsten wires. Emitter surface modifications are discussed. Specific examples are given. Dissert. Abstr.

N81-30206 Alabama Univ., Birmingham.
INSTRUMENTAL IMPROVEMENTS IN X-RAY PHOTOELECTRON SPECTROSCOPY AND APPLICATIONS TO GLASS SURFACES Ph.D. Thesis
Michael Gary Moskot 1980 266 p
Avail: Univ. Microfilms Order No. 8114902

A three axis magnetic field control system was built for an X-ray photoelectron spectrometer system, utilizing three mutually perpendicular sets of Helmholtz coils along with a feedback system constructed on a single printed circuit board. The unit proved capable of controlling the magnetic field to within + or - 100 microgausses of zero during short periods (minutes). Long term (hours) drift in the field remained under 250 microgausses. A position sensitive detector system was implemented using a channel electron multiplier array and the risetime method of event location. The time of data acquisition was reduced by a factor of 20 as compared with the narrow slit detector system previously used in the system. The spectrometer improvements resulted in an improved resolution over that of the previous configuration; faster analysis time and a more convenient means of accumulating data were obtained. Dissert. Abstr.

N81-30207 North Carolina Univ. at Chapel Hill.
ANALYSIS OF GAS CHROMATOGRAPHY/FOURIER TRANSFORM INFRARED DATA Ph.D. Thesis
Bruce Allan Hohne 1980 150 p
Avail: Univ. Microfilms Order No. 811482

An introduction to GC/FTIR is presented which describes the development of the technique and the instrumentation. The basis of FTIR is covered along with the reasons for its use in

GC/IR. Unfortunately, the amount of computations required to produce a standard IR spectrum from FTIR data is substantial. Reducing the amount of computations required to analyze GC/FTIR data is one of the main considerations of the research presented. Various methods for the reconstruction of GC/FTIR chromatograms from the single scan interferograms collected are described. The methods are compared on the basis of the signal to noise ratio of the chromatograms produced, and on an estimate of the number of computations required to process each interferogram. Included are methods based on the intensity of the interferogram and on very low resolution Fourier transform spectra. The Gram-Schmidt reconstruction was found to be the most sensitive reconstruction method tested and also requires fewer calculations than most algorithms tested. Dissert. Abstr.

N81-30208 Arizona State Univ., Tempe.
ION CHROMATOGRAPHIC ANALYSIS OF GEOLOGICAL AND ENVIRONMENTAL SAMPLES Ph.D. Thesis
Keenan Lane Evans 1981 166 p
Avail: Univ. Microfilms Order No. 8116426

An analytical technique, ion chromatography was applied to the analysis of a wide range of interesting geological and environmental samples. Combustion and pyrohydrolytic sample preparation methods were coupled with final measurement by ion chromatography to yield a novel overall analytical scheme that is capable of rapidly, accurately and precisely determining total fluorine, chlorine and sulfur in solid samples. The significance of these elements in geological samples is noted and previous methods of determination are discussed. Dissert. Abstr.

N81-30209 Johns Hopkins Univ., Baltimore, Md.
THE ADSORPTION OF HYDROGEN OF ALUMINA-SUPPORTED PLATINUM CATALYSTS Ph.D. Thesis
Linda Ann Teleshefsky 1981 237 p
Avail: Univ. Microfilms Order No. 8115726

The adsorption of hydrogen was studied on a series of alumina-supported platinum catalysts containing from 10.00% down to 0.62% by weight platinum, by volumetric gas adsorption, infrared spectroscopy, and temperature programmed desorption (TPD). Hydrogen gas adsorption measurements showed that the H/Pt ratios increased to values greater than 1 as the metal concentration in the samples decreased. Isotherms at room temperature and -195 C were used to group hydrogen adsorption into four different categories. One type was irreversible bonded at room temperature and a second type was irreversibly bonded at -195 C. The third category included hydrogen that adsorbed irreversibly on the sample below room temperature to above -195 C, and the fourth corresponded to additional hydrogen that adsorbed at -195 C after exposure of the sample to hydrogen at room temperature, pumping, and then cooling to -195 C and reexposing to hydrogen. As the platinum concentration in the samples decreased, it was observed that less hydrogen adsorbed irreversible on the samples at -195 C. Dissert. Abstr.

N81-30210 North Carolina Univ. at Chapel Hill.
APPLICATIONS OF INFORMATION THEORY IN CHEMICAL PHYSICS Ph.D. Thesis
Stephen Benson Sears 1980 134 p
Avail: Univ. Microfilms Order No. 8114862

The application of statistical information theory to problems of chemical physics are reported. Both practical and theoretical aspects of this theme are considered. An historical survey of the concept of entropy in physics and an introduction to Shannon's theory of information are included. The informaton theoretic technique for entropy maximization is applied to compton profile data, employing single and double distribution moments as constraints. Several information theory concepts are introduced, including Fisher's information, Fisher's locality information matrix, and the Kullback-Leibler information measure.
Dissert. Abstr.

N81-30211 Arizona State Univ., Tempe.
THERMODYNAMICS OF SOLID SOLUTION FORMATION Ph.D. Thesis
Peter Kenneth Davies 1981 209 p
Avail: Univ. Microfilms Order No. 8117165

Deviations from ideality in a number of binary solid solutions were parameterized using regular and subregular thermodynamic mixing models. Linear correlations were obtained between calculated interaction parameters and a term representing the volume mismatch of the two end-members. The correlations were found to segregate the solid solutions according to the valence of the ions being mixed. Alkali halide systems were found to show smaller relative deviations from ideality than oxide and chalcogenide systems. The ratio of the slopes of these correlations agreed with predictions made from considerations of the effective charges of the ions being mixed. The correlations were used to predict expected critical temperature and compositon variations as a function of component volume mismatch. Calculations of the free energies of rocksalt to nickel arsenide, and of wurtzite/sphalerite (four fold coordination) to rocksalt/nickel arsenide (six fold coordination) transitions are also made using interaction parameters predicted by the correlations. Dissert. Abstr.

N81-30212*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC MICROSCOPY STUDIES OF EMULSIONS
William K. Witherow Aug. 1981 60 p refs
(NASA-TM-82437) Avail: NTIS HC A04/MF A01 CSCL 07D

A holographic microscopy system that records and observes the dynamic properties of separation of dispersed immiscible fluids is described. The holographic construction system and reconstruction system that were used to obtain particle size and distribution information from the holograms are discussed. The holographic microscopy system is used to observed the phase separating processes in immiscible fluids that were isothermally cooled into the two phase region. Nucleation, growth rates, coalescence, and particle motion are successfully demonstrated with this system. Thus a holographic particle sizing system with a resolution of 2 micrometers and a field of view of 100 cu cm was developed that provides the capability of testing the theories of separating immiscible fluids for particle number densities in the range of 10 to 10 to the 7th power particles.
E.D.K.

N81-30213# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPECTROSCOPIC MEASUREMENT OF FLAME TEMPERATURE [MEDIDA DE TEMPERATURA DE CHAMAS POR ESPECTROSCOPIA]
M. A. Goday Solar and R. Ranvaud Nov. 1980 3 p refs In PORTUGUESE; ENGLISH summary Submitted for publication (INPE-1893-RPE/234; Preprint-14) Copyright. Avail: NTIS HC A02/MF A01

A rotational excitation temperature measurement of a premixed flame, using propane as fuel and synthetic air as oxidant is discussed. The method utilized involves measuring the intensities of the lines in the rotational structure of vibrational - electronic transitions. The flame emission spectra were analyzed in the visible region. The rotational excitation temperature of the flame region, whose image was cast onto the monochromator slit, was determined using the 4314A rotational fine structure band emitted by the radial CH. J.M.S.

N81-30214# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ROTATIONAL EXCITATION TEMPERATURE MEASUREMENTS IN FLAMES M.S. Thesis - 1 Oct. 1980 [MEDIDA DE TEMPERATURA DE EXCITACAO ROTACIONAL EM CHAMAS]
Maria Aparecida Soler Mar. 1981 88 p refs In PORTUGUESE; ENGLISH summary
(INPE-2008-TDL/046) Avail: NTIS HC A05/MF A01

Rotational excitation temperature measurements in the premixed flame, using propane as fuel and synthetic air as oxidant, are presented. The method utilized involves the intensities measurement of the lines in the rotational structure of vibrational electronic transitions. The flame emission spectra were analyzed in the visible region. The rotational excitation temperature of the region flame, whose image was made in the monocromator slit, was determined by the intensities distribution of the 4314A rotational fine structure band emited by CH radical. Author

N81-30215# Army Armament Research and Development Command, Aberdeen Proving Ground, Md.

TABLES OF CALCULATED TRANSISTION PROBABILITIES FOR THE A-X SYSTEM OF OH

David R. Crosley and Irving L. Chidsey Jun. 1981 58 p refs (DA Proj. 1L1-61102-AH-43)
(AD-A101308; ARBRL-TR-02326) Avail: NTIS HC A04/MF A01 CSCL 07/4

Calculations have been carried out for the electronic transition probabilities as a function of vibrational and rotational level for the A-X system of the OH molecule. The electronic transition moment used is of hyperbolic form, combining a linear form at small internuclear distance with a smooth asymptotic behavior at large internuclear distance patterned after ab initio calculations. Wavefunctions were obtained using the RKR method. Presented in this report are full tables of transition probabilities, Einstein emission coefficients, and Einstein absorption coefficients for a wide range of levels. Author (GRA)

N81-30216# TRW Defense and Space Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.

FORCED-CONVECTION EXTINCTION OF A DIFFUSION FLAME SUSTAINED BY A CHARRING BODY Final Report, 10 Sep. 1980 - 1 May 1981

George Carrier, Francis Fendell, Phillip Feldman, and Stanton Fink May 1981 106 p refs
(Contract EMW-C-0371)
(AD-A101622; TRW-37503-6001-UT-00) Avail: NTIS HC A06/MF A01 CSCL 21/1

The subsonic isobaric forced-convective flow of air past a pyrolyzing, char-forming body outgassing combustible fuel vapor is examined; the goal is to seek a generalized approach toward establishing approximate criteria for extinction of burning. A Shvab-Zeldovich formulation (incorporating, inter alia, a one-step irreversible exothermic finite-rate chemical reaction) is adopted to describe the gas-phase burning of initially unmixed reactants. For specificity, a sublimation model is adopted to describe the endothermic gasification at the surface of the (isothermal) pristine body; a nonisothermal porous char layer (through which combustible vapor, from pyrolysis of the pristine-body surface, can diffuse to the surrounding air) envelopes the pristine body. Important features of the steadily burning configuration can be obtained for any simple bluff body, and sequentially the question of flame stability can be addressed via exploitation of the well-studied counterflow-diffusion-flame two-point-boundary-value problem for describing extinction of unpremixed burning. Thus, known results for the minimum Damkohler number (ratio of forced-convective-flow time to chemical-reaction time) compatible with vigorous burning of large-activation-energy, large-heat-of-combustion, counterflow diffusion flames are applicable. GRA

N81-30217# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

LITHIUM: CRYPTAND 2.1.1 ELECTRIDES: A STUDY OF SOME MAGNETIC AND OPTICAL PROPERTIES Ph.D. Thesis

John Steven Landers 1981 239 p refs
(AD-A101627; AFIT-CI-81-6D) Avail: NTIS HC A11/MF A01 CSCL 07/4

Dark blue microcrystalline powders produced from lithium metal and the cation complexing agent cryptand 2.1.1 (C211) were prepared from ammonia and from methylamine solutions. The mole ratio of lithium to cryptand, R, was varied from 0.60 to 2.0 but there was no evidence for Li(-). The optical and magnetic properties indicate that Li(-)C211.e(-) is an electride, a member of the class of materials in which the anions are electrons. Samples were studied by optical transmission spectroscopy, EPR spectroscopy, magnetic susceptibility, and microwave and d c conductivities. In many cases several methods were used to characterize samples prepared from the same solution; correlation among the various properties is high. GRA

N81-30218# United Technologies Corp., South Windsor, Conn. Power Systems Div.

INVESTIGATION OF CARBON-FORMATION MECHANISMS AND FUEL-CONVERSION RATES IN THE ADIABATIC REFORMER Annual Report, 19 Mar. 1980 - 10 Mar. 1981

1981 20 p refs
(Contract DE-AC21-80MC-14395)
(DOE/MC-14395/T1) Avail: NTIS HC A02/MF A01

A reactor model was established for the adiabatic reformer which will predict process stream compositions and include carbon formation processes. Four subordinate tasks were proposed to achieve the objective. These are: (1) to determine on selected catalysts rate expressions for catalytic reactions occurring in the entrance section of the adiabatic reformer; (2) to determine with microbalance experiments critical conditions for carbon formation on selected catalysts; (3) to establish a reactor model to predict process stream compositions in the adiabatic reformer using data from task 1 for catalytic reactions and data from the literature for homogeneous gas phase reactions; and (4) to establish a model to predict carbon formation by combination of the model for process steam composition from task 3 and data for carbon formation from task 2. DOE

N81-30219# Georgia Univ., Athens. Dept. of Microbiology.

MICROBIAL OXIDATION OF AROMATIC SULFUR AND NITROGEN CONTAINING CONSTITUENTS OF FOSSIL FUELS Progress Report, 1 Aug. 1980 - 1 Apr. 1981

William R. Finnerty Apr. 1981 16 p refs
(Contract DE-AS09-80ER-10683)
(DOE/ER-10683/1) Avail: NTIS HC A02/MF A01

Oxidative conversion of these S and N containing hydrocarbons to water soluble S or N containing organic compounds was achieved at conversion efficiencies in excess of 90% within 12 hours. Several bacterial species were isolated which attack oxidatively specific S and N containing constituents present in crude oil and synfuels. The bacteria mediated oxidations are oblique aerobic reactions and effect the conversion of S and N containing constituents to water soluble products with the sulfur and nitrogen atom remaining bound in covalent form in the water soluble organic moiety. Dibenzothiophene and carbazole were used in the experiments. DOE

N81-30220# South Carolina Univ., Columbia. Coll. of Engineering.

COMBUSTION-RATE PREDICTIONS FOR CONTROLLED-AIR INCINERATORS

D. I. Orloff and Harry E. Hootman 1981 22 p refs Presented at the ASME/USEPA Hazardous Waste Incineration Conf., Williamsburg, Va., 27-28 May 1981 Prepared in cooperation with Dupont de Nemours (E. I.) and Co., Aiken, S.C.
(Contract DE-AC09-76SR-00001)
(DP-MS-81-8; CONF-810551-1) Avail: NTIS HC A02/MF A01

Combustion rates of typical radioactive waste materials were modeled as a function of incinerator operating conditions. The analytical model developed was incorporated into a waste burning transient code. The code predicts instantaneous air requirement, heat energy release, and waste package burning time as a function of waste type, package size, combustion chamber size, and temperature. The computed combustion rates and burning times approximate measured values in pilot (0.5 kg/h) and full scale (5 kg/h) alpha incinerators for a wide variety of typical waste materials and waste mixtures. DOE

N81-30221# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.

INFLUENCE OF FUEL SULFUR ON THE SELECTIVE REDUCTION OF NO BY NH3

Donald Lucas and Nancy J. Brown Jan. 1981 8 p refs Presented at the 1st Spec. Meeting of the Combust. Inst., Bordeaux, France, 20-25 Jul. 1981
(Contract W-7405-eng-48)
(LBL-12128; CONF-810704-2) Avail: NTIS HC A02/MF A01

More intensive regulations of the emissions of nitrogen oxides from stationary combustion sources have prompted the innovation and characterization of control technologies suitable for applications in utilities. One of the more recent and attractive abatement technologies is the Thermal DeNO(sub x) process which was described by Lyon and Longwell. This process removes NO by selectively reducing it with NH3 added to the post combustion gases containing excess oxygen. This process is thus independent of the NO formation mechanism and makes no distinction between thermal and fuel NO. The present study is concerned with characterizing the selective reduction process for light distillate

oil fuel admixed with variable amounts of pyridene and thiophene in a laboratory scale combustion tunnel under a variety of experimental conditions. Those aspects of the study concerned with the investigation of possible synergistic effects between the sulfur and selective reduction chemistry are reported. DOE

N81-30222# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
COAL CONVERSION SOLID WASTES: CHARACTERIZATION FOR ENVIRONMENTAL ASSESSMENT
S. Y. Lee and W. J. Boegly, Jr. Jun. 1981 43 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7533) Avail: NTIS HC A03/MF A01

Physicochemical and leaching properties of coal conversion solid wastes produced by British Gas-Lurgi, Cogas, and Texaco gasification pilot plants were measured in order to assess the potential environmental impact caused by disposal of these wastes. The British Gas-Lurgi waste was composed of homogeneous calcic aluminosilicate glass with less than 1 percent of metallic iron particles. Major and trace elements were diluted by the influx of limestone added during the slagging process. The Cogas waste was partially vitrified ferruginous aluminosilicate with a surface occasionally covered by iron oxide coatings. Immiscible iron oxide and iron sulfide phases in the aluminosilicate matrix of ferromagnetic particles were detected. The Texaco gasification waste was composed of sulfur rich ferruginous aluminosilicate particles, and the surface of the particles was extensively coated by amorphous iron sulfide and occasionally by lepidocrocite. Pyrrhotite mineral was dominant in the ferromagnetic fraction. DOE

N81-30223# California Univ., Berkeley. Lawrence Berkeley Lab.
STRONG IGNITION LIMITS FOR METHANE-HYDROGEN MIXTURES
R. K. Cheng and A.K. Oppenheim Jan. 1981 11 p refs Presented at the 1st Intern. Spec. Meeting of the Combust. Inst., Bordeaux, France, 20-25 Jul. 1981
(Contract W-7405-eng-48; Grant NSF ENG-78-12372)
(LBL-12146; CONF-810704-5) Avail: NTIS HC A02/MF A01

A study of the auto ignition behind relected shock in eleven mixtures of CH4-O2, H2-O2, and CH4-H2-O2 covering a temperature range of 900 to 2400 K and pressure range of 1 to 3 atm was carried out. The induction times were correlated with an equation of the Arrhenius form that was found to be quite satisfactory. All the strong ignition limits determined could be expressed in terms of a constant value expressed in terms of the partial derivative of induction time with respect to temperature at constant pressure, deduced for each mixture from the correlation equation being quite insensitive to variations in initial mixture compositions for the induction time. The values for the strong ignition limits for all test mixtures used were grouped around -0.5 microsec/K and thermodynamic conditions. This leads to the conclusion that the dominating factor in establishing the actual level of the strong ignition limit is the sensitivity of the induction time to temperature. DOE

N81-30224# California Univ., Livermore. Lawrence Livermore Lab.
EXPERIMENTAL AND THEORETICAL STUDY OF FLAME INHIBITION BY BROMINE-CONTAINING COMPOUNDS
C. K. Westbrook, Donald G. Beason, and Norman J. Alvares 20 Jan. 1981 6 p refs Presented at the 1st Intern. Spec. Meeting of the Combust. Inst., Bordeaux, France, 20-25 Jul. 1981
(Contract W-7405-eng-48)
(UCRL-85409; CONF-810704-1) Avail: NTIS HC A02/MF A01

The effects of several inhibitors on hydrocarbon air flames were examined. Efforts were made to build a consistant picture of chemical kinetic flame inhibition, beginning with a simple halogen molecule such as HBr and progressing sequentially towards more complex and more practical inhibitors such as CF3Br. DOE

N81-30225# California Univ., Livermore. Lawrence Livermore Lab.
PROPOSED SOLAR-FURNACE STUDY OF ZINC SULFATE DECOMPOSITION
Oscar H. Krikorian and Pamela K. Shell 16 Apr. 1981 7 p refs Presented at the Solar Thermal Test Facilities Users Association Ann. Business and Technical Meeting, Pasadena, Calif., 20-24 Apr. 1981
(Contract W-7405-eng-48)
(UCRL-85743; CONF-810469-1) Avail: NTIS HC A02/MF A01

A solar furnace study of zinc sulfate is proposed. The advantages of the high temperatures and rapid heating rates provided by solar collectors for the decomposition of zinc sulfate. The use of a rotary kiln designed to improve the efficiency in working with solids that have low absorbtivities, such as solid sulfates, is planned. The overall goal is to establish the applicability of solar central receivers to thermochemical cycles that can use solid state sulfate decomposition as the high temperature step. DOE

N81-30226# Battelle Pacific Northwest Labs., Richland, Wash.
CHEMICAL PRODUCTION FROM INDUSTRIAL BY-PRODUCT GASES Final Report
S. E. Lyke and R. H. Moore Apr. 1981 128 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3753) Avail: NTIS HC A07/MF A01

The potential for conservation of natural gas is studied and the technical and economic feasibility and the implementation of ventures to produce such chemicals using carbon monoxide and hydrogen from byproduct gases are determined. A survey was performed of potential chemical products and byproduct gas sources. By-product gases from the elemental phosphorus and the iron and steel industries were selected for detailed study. Gas sampling, preliminary design, market surveys, and economic analyses were performed for specific sources in the selected industries. The study showed that production of methanol or ammonia from byproduct gas at the sites studied in the elemental phosphorus and the iron and steel industries is technically feasible but not economically viable under current conditions. Several other applications are identified as having the potential for better economics. DOE

N81-30227# Los Alamos Scientific Lab., N. Mex.
BURNING AND DETONATION
Charles A. Forest 1981 10 p refs Presented at the 7th Symp. on Detonation, Annapolis, 16-19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-839; CONF-810602-21) Avail: NTIS HC A02/MF A01

The effect of confined burning explosive abutting nonburning explosive in a variety of one dimensional geometries was studied by numerical simulation, demonstrating the effects of confinement, burning rate, and shock sensitivity. The model included porous bed burning, compressible solids and gases, shock induced decomposition with possible transition to detonation and constant velocity ignition waves. Two phase flow, gas relative to solid was not allowed. Because the shock sensitivity of an explosive changes with explosive density and because such experimental data is rarely available over a range of densities, a method for the calculations of the density effect on the initial shock pressure, distance to detonation (wedge test) measure of shock, sensitivity is given. The calculation uses the invariance with density of the shock particle velocity as a function of time to detonation, and the experimental data at some high density. DOE

N81-30228# Sandia Labs., Albuquerque, N. Mex.
LAGRANGIAN-EULERIAN CALCULATION OF TURBULENCE AFFECTS ON PREMIXED FLAME PROPAGATION
W. T. Ashurst Mar. 1981 20 p refs Presented at the Spring Meeting on the Western States Sect. on the Combust. Inst., Pullman, Wash., 13-14 Apr. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-8640; CONF-810466) Avail: NTIS HC A02/MF A01

The interaction between time dependent turbulent flow structure and an irreversible one step decomposition reaction are explored. This reaction is a special case of A + B goes to products; i.e., when the concentration of A is much smaller than that of B. The time dependent flow structure is calculated by the discrete vortex dynamics method. The flow field is two

dimensional and is confined to a unit square through the use of periodic boundary conditions. The velocity field from the known vortex locations is used to describe the convection of temperature and a single species on a fixed Eulerian mesh. Unit-Lewis number, temperature independent transport coefficients, and constant density are assumed. The calculated turbulent flame speed agrees with the wrinkled laminar flame model and experimental correlations in that at constant turbulent length scale the flame speed depends linearly on turbulent intensity. DOE

N81-30229# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Physics and Laser Spectroscopy Group.
ABSORPTION SPECTRA OF CRYSTALLINE AND AMORPHOUS SILICON BY PHOTOTHERMAL DEFLECTION SPECTROSCOPY
W. B. Jackson, Nabil M. Amer, Daniele Fournier (Ecole Superieure de Physique et Chimie Industrielles), and A. Claude Boccara (Ecole Superieure de Physique et Chimie Industrielles) Jun. 1981 6 p refs Presented at 2nd Intern. Photoacoustic Spectro Conf., Berkeley, Calif., 22-25 Jun. 1981
(Contract W-7405-eng-48)
(LBL-12366; CONF-810630-4) Avail: NTIS HC A02/MF A01

Absorption spectra of crystalline and amorphous silicon were obtained by photothermal deflection spectroscopy. Sensitivity was compared to that PZT and gas photoacoustics. DOE

N81-30230# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
THERMAL EMISSION RESIN BEAD MASS SPECTROMETRIC TWO-FILAMENT ARRANGEMENT EVALUATION - A.82. 2: THE RAPID BULK RESIN BEAD METHOD OF SAMPLE PREPARATION FOR MASS ANALYSIS OF PLUTONIUM AND URANIUM IN SPENT REACTOR FUEL - A.56
H. S. McKown, R. L. Walker, D. H. Smith, and J. A. Carter May 1981 18 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7834) Avail: NTIS HC A02/MF A01

Investigations to improve precision on mass spectrometric isotopic ratio measurements are reported. Instructions for the rapid preparation and mass spectrometric analysis of uranium and plutonium samples by the resin bead technique are presented. Means of obtaining better precision on mass spectrometric isotopic ratio measurements are considered. Use of a two filament source configuration on a pulse counting mass spectrometer was investigated, but better results are obtainable with commercially available source systems. The resin bead mass spectrometric procedure under consideration by ASTM is presented. DOE

N81-30231# Brookhaven National Lab., Upton, N. Y. Energy Storage and Conversion Div.
CHEMICAL/HYDROGEN ENERGY SYSTEMS Annual Report, 1 Jan. - 31 Dec. 1980
M. Bonner, T. Botts, J. DAcierno, C. Fredrickson, F. Hill, G. Kissel, J. McBreen, A. Mezzina, W. OGrady, and M. Rosar Apr. 1981 137 p refs
(Contract DE-AC02-76CH-00016)
(BNL-51362) Avail: NTIS HC A07/MF A01

Hydrogen technology, which deal with electrolytic hydrogen production, and end-use, and chemical energy systems and chemical heat pumps, which deal with hydrogen separation/recovery and reversible chemical reactions as can be applied to space conditioning and industrial process heat management are discussed. DOE

N81-30232# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
IRON-INDUCED DEACTIVATION OF SUPPORTED NICKEL METHANATION CATALYSTS Final Report
James A. Dumesic 1980 156 p refs
(Contracts DE-FG21-78ET-12248; ET-78-G-01-3380)
(DOE/ET-12248/T3) Avail: NTIS HC A08/MF A01

A high pressure vessel was tested and shown to be effective for the simultaneous collection of methanation kinetics and in situ Mossbauer spectra. Using this cell, the deactivation of an alumina supported nickel catalyst (Ni/Al2O3) was studied before, during and after the dosing of Fe(CO)5 onto the sample under methanation reaction conditions. The Mossbauer spectra collected under these methanation reaction conditions (with H2/CO partial pressure ratios near 10) showed the iron on Ni/Al2O3 to be present as an iron carbide. Treatment in hydrogen of the iron deactivated catalyst at 6200 K gave rise to a Mossbauer spectrum characteristic of metallic iron, indicating that the iron on Ni/Al2O3 is not in direct contact with nickel (i.e., an FeNi alloy is not formed nor does iron form a monolayer coating over nickel crystallites). DOE

N81-30233# Illinois Univ. at Urbana. Dept. of Metallurgy.
ANALYTICAL TRANSMISSION ELECTRON MICROSCOPY IN MINERALS PROCESSING
Hamish Fraser, K. C. Hsieh, and M. E. Twigg 1981 16 p refs
(Contract DE-AC02-76ER-01198)
(DOE/ER-01198/1351) Avail: NTIS HC A02/MF A01

A review of the possibilities of performing microchemical analysis in thin sections using a combination of scanning transmission electron microscopy and energy dispersive spectroscopy of X-rays is given. Particular attention is paid to the factors that limit accurate analysis at the highest spatial resolution. As an example of the use of these techniques applied to a potential problem in minerals processing, the identification of pyrite and pyrrhotite particles in Illinois, Herrin no. 6 coal is presented. DOE

N81-30234# Los Alamos Scientific Lab., N. Mex.
LASER-INDUCED BREAKDOWN SPECTROSCOPY: DETECTING DOSIUM AND POTASSIUM IN COAL GASIFIERS
T. R. Loree and L. J. Radziemski 1981 30 p refs Presented at the Symp. on Instr. and Control for Fossil Energy Processes, San Francisco, 8 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1526; CONF-810607-2) Avail: NTIS HC A03/MF A01

A real-time monitor of trace quantities of elements present in hostile environments such as coal gasifier process streams is developed. With laser-induced breakdown spectroscopy, the ability to probe a real process stream and achieve appropriate levels of detectability for sodium and potassium with real-time response is demonstrated. DOE

N81-30235# Los Alamos Scientific Lab., N. Mex.
SOLID-STATE PHASE TRANSITIONS IN CuCl UNDER HYDROSTATIC PRESSURES TO 12.8 GPa
D. H. Liebenberg, R. L. Mills, C. Y. Huang, C. Olsen, and L. C. Schmidt 1981 4 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 6-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1443; CONF-810429-30) Avail: NTIS HC A02/MF A01

The phase transitions in solid CuCl under hydrostatic conditions at pressures to 12.8 GPa are examined. The transition at 4.4 GPa from zinc blende to tetragonal is observed. Our negative observations for the upper transition at 8.2 GPa and for the formation of an opaque phase due to the disproportionation reaction support the contention that pressure gradients are important in affecting the behavior of pure CuCl. DOE

N81-30236# California Univ., Berkeley. Lawrence Berkeley Lab.
EXPERIMENTAL STUDY OF THE FLOWFIELD OF A V-SHAPED PREMIXED TURBULENT FLAME
R. K. Cheng and T. T. Ng Jan. 1981 7 p refs Presented at the 1st Intern. Specialists Meeting of the Combustion Inst., Bordeaux, France, 20 Jul. 1981
(Contract W-7405-eng-48)
(LBL-12141; CONF-810704-4) Avail: NTIS HC A02/MF A01

The flowfield of a V-shaped, premixed ethylene/air flame in grid induced turbulence was studied using laser Doubler velocimetry. The conditions covered free stream velocities of 5 and 7 m/s and equivalence ratios ranging from 0.6 to 0.78. The two dimensional velocity vectors obtained indicate that flow deflection in the free stream was significant and seemed to correlate with the flame angle. The influennce of the flame holder

wake on the flame was demonstrated. In the presence of the flame, an increase in the turbulence level in the free stream was found and was attributed to fluctuations in flow deflection induced by the fluctuating flame. DOE

N81-30237# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.

MODELLING OF BURNING AND EXTINCTION CHARACTERISTICS OF A POLYMER DIFFUSION FLAME AND COMPARISON WITH EXPERIMENT

W. J. Pitz and R. F. Sawyer Apr. 1981 18 p refs
(Contracts W-7405-eng-48; NBS-8-05180)
(LBL-12214; CONF-810713-1) Avail: NTIS HC A02/MF A01

The importance and contribution of the inherent flammability of polymeric materials to problems of fire safety was investigated. An attempt was made to provide a better understanding and interpretation of previous experimental investigations of polymer flammability. The structure of opposed flow diffusion flames was measured using both gaseous and solid fuels. The opposed flow diffusion flame was a convenient geometry for the study of the flammability of polymers because it allowed both steady, diffusion controlled burning and extinction to be observed under well-controlled laboratory conditions. Conveniently available experimental parameters included fuel composition, oxidizer composition, and oxidizer blowing rate. DOE

N81-30238# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

ELECTROCHEMICAL STUDIES OF THE FILM FORMATION ON LITHIUM IN PROPYLENE CARBONATE SOLUTIONS UNDER OPEN CIRCUIT CONDITIONS

Y. Geronov (Bulgarian Academy of Science), F. Schwager, and R. H. Muller Apr. 1981 58 p refs
(Contract W-7405-eng-48)
(LBL-12102) Avail: NTIS HC A04/MF A01

The nature of protective surface layers formed on lithium in propylene carbonate solutions of LiClO4 and LiAsF6 at open circuit was investigated by electrochemical pulse measurements and other techniques. The results are consistent with the first formation of a compact thin layer of Li2O by reaction with residual water. This layer acts as a solid ionic conductor. Slow corrosion processes produce a thicker porous overlayer. DOE

N81-30239# California Univ., Berkeley. Lawrence Berkeley Lab.

DETERMINATION OF RELATIVE CONCENTRATIONS OF PRIMARY AND SECONDARY ORGANICS AND SPECIATION OF SULFUR COMPOUNDS BY THERMAL ANALYSIS AND PHOTOELECTRON SPECTROSCOPY

T. Novakov, R. L. Dod, L. A. Gundel, and A. D. A. Hansen Apr. 1981 8 p refs Presented at the Workshop on Phys. and Chem. of Energy Related Atmospheric Pollution, Harper's Ferry, W. Va., 21 Apr. 1981
(Contract W-7405-eng-48)
(LBL-12539; CONF-810475-1) Avail: NTIS HC A02/MF A01

Carbon, sulfur, and nitrogen containing particles account for most of the anthropogenic aerosol particle burden. Methodology developed to quantitate the amounts of primary and secondary particulate carbon data are presented on speciation of sulfur compounds by a novel approach using thermal analysis and photoelectron spectroscopy. DOE

N81-30240# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.

ON-LINE ZEEMAN ATOMIC-ABSORPTION SPECTROSCOPY FOR MERCURY ANALYSIS IN OIL-SHALE GASES Final Report

D. C. Girvin and J. P. Fox Mar. 1981 108 p refs Prepared for the Radian Corp., Austin, Tex.
(Contracts W-7405-eng-48; EPA-78-D-X0350)
(LBL-9702-Rev) Avail: NTIS HC A06/MF A01

An instrumental technique to continuously measure total mercury in gas streams on a real time basis is described. The technique utilizes Zeeman atomic absorpton spectroscopy (ZAA) for on-line measurement of mercury in the presence of smoke, organic vapors, and oil mist which are typically present in offgases from oil shale processing plants. The accuracy of the ZAA background correction technique enables analytical measurement of mercury with up to 95% attenuation of the 2537A analytical line by broadband UV absorption. Furnaces with optical absorption tubes of different lengths are used depending upon the mercury concentration. Between 5 and 250 ppB (nanomoles Hg/mole of gas) of mercury in an 18-cm furnace is used. The instrumental response with this furnace is characterized by a detection limit (DL) of 2 ppB, a linear response up to 100 ppB, and a precision of + or - 7% or better. DOE

N81-30241# California Univ., Berkeley. Lawrence Berkeley Lab.

STUDY OF RING AND RING-DISK ELECTRODES Ph.D. Thesis

Peter Eugene Pierini May 1981 117 p
(Contract W-7405-eng-48)
(LBL-12776) Avail: NTIS HC A06/MF A01

Rotating ring and ring-disk electrodes were modeled. The primary, secondary, and below-the-limiting current distributions for ring electrodes were computed. The ring-disk system was modeled for secondary and below-the limiting current distribution. Mass transfer measurements in laminar, transition, and turbulent flows were made for thin rotating rings. The effect of cell walls on the potential distribution of disk electrodes was computed. DOE

N81-30242# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

LASER PHOTOACOUSTIC SPECTROSCOPY OF HIGH VIBRATIONAL OVERTONES

James C. Wong and C. Bradley Moore 1981 3 p refs Presented at the 2nd Intern. Photoacoustic Spectroscopy Conf., Berkeley, Calif., 22 Jun. 1981
(LBL-12523; CONF-810630-5) Avail: NTIS HC A02/MF A01

Intracavity dye laser photoacoustic spectroscopy is used to detect vibrational overtone transitions in order to understand intramolecular mode coupling in vibrationally excited, gaseous, organic molecules. DOE

N81-30243# Brookhaven National Lab., Upton, N. Y.

REAL TIME MASS FLUX MEASUREMENTS OF GAS-SOLID SUSPENSIONS AT LOW VELOCITIES

J. H. Saunders, B. T. Chao (Illinois Univ., Urbana), and S. L. Soo (Illinois Univ., Urbana) 1981 13 p refs Presented at the Powder and Bulk Solids Conf., Chicago, 12 May 1981
(Contract DE-AC02-76CH-00016; Grants NSF ENG-76-01665; NSF ENG-78-12796)
(BNL-29519; CONF-810581-1) Avail: NTIS HC A02/MF A01

Measurement of the particulate mass flux was made based upon a novel electrostatic technique. A small conducting wire sensor was inserted in the flow and as each particle hit the sensor an individual pulse of current was identified. Through suitable electronic circuitry, the number of pulses in a given time were counted. This was a direct measure of the number of particle-probe collisions which was related to local particle mass flow. The technique was applied to vertical gas-solid flow where the fluid velocity was slightly above the particle terminal velocity. Under these conditions, a sufficient signal to noise ratio was not found. The probe system was modified by extracting a particulate sample isokinetically and accelerating the particles to a sufficient velocity by an area reduction in the sampling tube. With this technique, the signal to noise ratio was about 12 to 1. Mass flux results are shown to compare favorably with filter collection and weighing. DOE

N81-30244# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

IMPROVED MODEL CALCULATIONS FOR THE ALKALI-RARE GAS INTERACTION

R. Dueren and G. Moritz Jun. 1980 25 p refs
(MPIS-7/1980; ISSN-0436 1199) Avail: NTIS HC A02/MF A01

Alkali-rare gas potentials are recalculated using the Baylis model for the electronic interaction. Discrepancies between experimental results and those obtained in previous applications

of this model were investigated. The importance of correct numerical integration and to a lesser extent, of reliable wave functions is demonstrated. A more realistic cut-off function was sought for the polarization contribution. Besides minor quantitative changes, it mostly affects sigma-states. Both improvements become more important for higher excited states. The results obtained are applied to the interaction between Na and rare gases. As before, the model fails to reproduce the experimental results for Ne. For Ar, Kr, and Xe, interatomic potentials for the A 2 Pi-state interaction are improved. Uncertainties in the well depth of this potential are of the order of 30%. Major improvements can thus be achieved with a correct numerical treatment.
Author (ESA)

N81-30245# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ELEMENTARY REACTIONS OF NH2 RADICALS IN THE GAS PHASE 2
W. Hack, O. Horie, and H. G. Wagner Jul. 1980 44 p refs
(MPIS-8/1980; ISSN-0436-1199) Avail: NTIS HC A03/MF A01

The rate constants for the reactions of NH2 with ozone and with n-pentane were detemined in the temperature range 250 to 360 K, over the pressure range 4 to 20 mbar, using a discharge flow apparatus. The NH2 radicals were generated by the reaction of ammonia with fluorine atoms produced in a microwave discharge. Relative concentrations of NH2 were determined by laser induced fluorescence of NH2. Arrhenius expressions for the two reactions are given. In the reaction with ozone, the metathesis of oxygen and NH2O is proposed as a possible initial step, the intermediate species NH2O reacting with ozone to form NH2 at longer reaction times. Kinetic data for the n-pentane reaction are interpreted to correspond to the metathesis reaction to form ammonia and C5H11; the latter reacts further with NH2 to give n-pentylamine as the final product.
Author (ESA)

N81-30246# Sheffield Univ. (England). Dept. of Control Engineering.
ACTION REQUIRED FOR IMPLEMENTATION OF MICROPROCESSOR CONTROL OF A DISTILLATION COLUMN
J. B. Edwards Jul. 1980 4 p ref Presented at SRC Vacation School on Computer Control
(RR-114) Avail: NTIS HC A02/MF A01

Guidelines are given for proving trials necessary before using a Texas microprocessor system in a laboratory class on column pressure control. Unit tasks to be performed in order to check the programmed microprocessor and input/output system as well as the remotely controlled column, are listed.
Author (ESA)

N81-30247# General Electric Co., Wilmington, Mass. Direct Energy Conversion Programs.
SOLID POLYMER ELECTROLYTE WATER ELECTROLYSIS TECHNOLOGY DEVELOPMENT FOR LARGE SCALE HYDROGEN PRODUCTION (DESIGN PHASE) Annual Report
J. H. Russell Nov. 1980 28 p refs Sponsored by the Gas Research Inst.
(PB81-201964; GRI-79/0102) Avail: NTIS HC A03/MF A01 CSCL 07A

The design for a water electrolysis module containing (14) cells each with 10 sq ft active area was completed. This included final drawings for Membrane/electrode assembly, Molded carbon current collector, Fluid plates, and Pneumatic end plates and boiling arrangements.
GRA

N81-30248# National Bureau of Standards, Washington, D.C.
AUTO: A REAL TIME DIFFRACTOMETER CONTROL SYSTEM
Robert L. Snyder (Alfred Univ.), Camden R. Hubbard, and Nicolous C. Panagiotopoulos Feb. 1981 107 p refs
(PB81-179186; NBSIR-81-2229) Avail: NTIS HC A06/MF A01 CSCL 07D

Two X-ray powder diffractometers are independently driven by the program. The program provides the capability to scan an entire spectrum and to carefully measure the intensities of individual lines for quantiative analysis. For intensity measurements, an optimization routine is used to either minimize data collection time, or to minimize the estimated standard deviation of the net intensity. The data file structures are designed to permit complete data analysis without further data input. The automation program also provides for file handling, including opening, writing, transferring, and deleting.
GRA

N81-30249# University of South Florida, Tampa.
TECHNIQUE FOR MEASURING REDUCED FORMS OF SULFUR IN AMBIENT AIR
Robert S. Braman and James M. Ammons Apr. 1981 58 p refs
(Grant EPA-R-806688)
(PB81-179772; EPA-600/7-81-041) Avail: NTIS HC A04/MF A01 CSCL 07D

Technique for measuring low concentrations of volatile sulfur compounds in ambient air is discussed. The technique consists of preconcentration of sulfur compounds by chemisorption on gold metal coated sand or gold foil surface followed by thermal desorption, separation, and detection by flame photometry. Breakthrough capacities are on the order of 1 microgram total sulfur compounds. The unique aspect of this research is the derivation of thiol type compounds, principally H2S and CH3SH, by ethyl iodide for partial separation of H25, DMS, SSO2, COS, and CH3SH. Best suited for the 0.01-5 ppb range, the technique is used to detect trace sulfur compound concentrations as low as 0.001 ppb by volume with 100L and larger sample volumes.
GRA

N81-30250# Montana Water Resources Research Center, Bozeman.
FLAMELESS ATOMIC ABSORPTION FOR TRACING THE FATE OF HEAVY METALS IN SOILS AND GROUNDWATER Final Report
Robert L. Sanks Sep. 1980 63 p
(Contract DI-14-34-0001-8028)
(PB81-189821; MWRRC-111; W81-02491; OWRT-A-109-MONT(1)) Avail: NTIS HC A04/MF A01 CSCL 07D

A Varian AA-5 atomic absorption unit for measuring trace metals in soils and aqueous solutions was modified to improve the accuracy of the results and to reduce interference from matrix substances. A woodriff constant temperature furnace (WCTF) was added to simplify and speed analysis and to permit direct introduction of soil samples without tedious chemical pretreatment. The attempted modifications led to a complete redesign of an atomic absorption unit for performing the analysis of metals in soils. The instrument is dependable and versatile and liquid or soil samples may be analyzed with no chemical pretreatment. Calibration curves for cadmium and zinc were established, techniques for sampling and performing direct analysis were developed.
GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N81-30251*# Southampton Univ. (England). Dept. of Mechanical Engineering.
THE STRUCTURE AND PROPERTIES OF DIFFUSION ASSISTED BONDED JOINTS IN 17-4 PH, TYPE 347, 15-5 PH AND NITRONIC 40 STAINLESS STEELS
D. A. Wigley Jul. 1981 31 p refs Prepared for Kentron International, Inc., Hampton, Va.
(Contract NAS1-16000)
(NASA-CR-165745) Avail: NTIS HC A03/MF A01 CSCL 11F

Diffusion assisted bonds are formed in 17-4 PH, 15-5 PH, type 347 and Nitronic 40 stainless steels using electrodeposited copper as the bonding agent. The bonds are analyzed by conventional metallographic, electron microprobe analysis, and scanning electron microscopic techniques as well as Charpy V-notch impact tests at temperatures of 77 and 300 K. Results are discussed in terms of a postulated model for the bonding process.
S.F.

N81-30252# Hughes Research Labs., Malibu, Calif.
DIRECT-WRITE ION LITHOGRAPHY Interim Report, 18 Apr. - 18 Oct. 1980
R. Vahrenkamp Griffiss AFB, N.Y. RADC Apr. 1981 19 p
(Contract F19628-79-C-0181; AF Proj. 2305)
(AD-A101427; RADC-TR-80-412) Avail: NTIS HC A02/MF A01 CSCL 14/5

An ion column utilizing mass-separated silicon ions at 150 kV (300 keV Si(++)) is an optimum choice for direct-write ion lithography. Since liquid metal ion source technology requires the use of copper or gold alloys of silicon to produce silicon ions, a mass separator is incorporated into the focusing column to remove the undesired ion species from the beam. Exposed depth measurements in PMMA were made using unseparated flood and focused ion beams from LM sources. The range of silicon ions in resist at 200 keV is greater than 0.5 micrometers. The resist was less sensitive to the high current density (1 A/sq. cm) focused beam than to the low current density (1 microAmps/sq. cm) flood beam. Repolymerization of the resist occurred at a dose approximately 80-90% of that required for maximum range due to the heavy gold or copper ions. The problems of range loss, repolymerization, and stray dc magnetic fields are also reasons for using a mass-separated column. Although more complex than a single accelerating lens, a high-resolution focusing column utilizing an ExB separator is feasible. Care will be taken in designing the separator to minimize astigmatism.
Author (GRA)

N81-30253# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Materials Integrity Branch.
COMPILATION OF MECHANICAL PROPERTY DATA FOR IMPROPERLY QUENCHED (SOFT) ALUMINUM PLATES Final Report, Aug. 1979 - Oct. 1980
Gerald J. Petrak and Allan W. Gunderson Jul. 1981 77 p refs
(AF Proj. 2418)
(AD-A101750; AFWAL-TR-81-4032) Avail: NTIS HC A05/MF A01 CSCL 11/6

Data is summarized from a number of investigations that dealt with the overall issue of substrength aluminum plates. An improper heat-treatment resulted in localized areas of the plates with low mechanical properties. For these plates it is shown that: tensile, compression, and bearing strengths are significantly reduced; fatigue properties are reduced, particularly for 2000-series alloys; fatigue crack growth rates are faster in 2000-series alloys but may be slower in high strength 7000-series alloys; stress corrosion properties are not reduced; toughness may increase; and the loss of strength can be reflected in electrical conductivity and hardness readings. This report also contains a statistical evaluation of tensile data from this study and other sources relating yield and ultimate tensile with electrical conductivity and hardness.
Author (GRA)

N81-30254# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
STRESS-CORROSION CRACKING STUDIES IN COAL-LIQUEFACTION SYSTEMS
V. B. Baylor and I. R. Keiser 1981 34 p refs Presented at the Intern. Corrosion Forum, Toronto, Ontario, 6-10 Apr. 1981; sponsored by the National Association of Corrosion Engineers
(Contract W-7405-eng-26)
(CONF-810402-9) Avail: NTIS HC A03/MF A01

Coal liquefaction plants with 6000 ton/d capacity are currently being planned as a step toward commercial production of synthetic fossil fuels. These plants demonstrate the large scale viability of the solvent refined coal (SRC) process, which was used since 1974 in two operating pilot plants: a 50 ton/d unit at Fort Lewis, Washington, and a 6 ton/d plant in Wilsonville, Alabama. Experience in these plants has shown that austenitic stainless steels are susceptible to stress corrosion cracking associated with residual stresses from cold working or welding. The corrodants responsible for the cracking are not yet positively identified but are suspected to include polythionic acids and chlorides. In order to screen candidate materials of construction for resistance to stress corrosion cracking, racks of stressed U-bend specimens in welded and as-wrought conditions were exposed at the Wilsonville and Fort Lewis SRC pilot plants. DOE

N81-30255# Giner, Inc., Waltham, Mass.
CORROSION CONTROL MANUAL FOR ALUMINUM SOLAR-COLLECTOR PANELS USING GLYCOL-WATER SOLUTIONS FOR HEAT TRANSFER/FREEZE PROTECTION
May 1981 13 p
(Contract DE-AC04-79CS-31072)
(DOE/CS-31072/1) Avail: NTIS HC A02/MF A01

Types of general and localized corrosion of aluminum are described, and factors that initiate or accelerate corrosion are discussed. Recommendations are made for controlling corrosion of aluminum. Aluminum corrosion inhibitors are listed for use with ethylene glycol and propylene glycol, and instructions are given for preparing inhibited glycols. DOE

N81-30256# Los Alamos Scientific Lab., N. Mex.
NON-CONVENTIONAL TUNGSTEN-BASE HARD METAL
Haskell Sheinberg 1981 35 p refs Presented at the 10th Plansee Seminar, Reutte, Austria, 1 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-722; CONF-810626-1) Avail: NTIS HC A03/MF A01

A novel hard-metal composition comprising borides and carbides of tungsten, nickel, and iron is made by reaction hot pressing mixtures of elemental tungsten, nickel, and iron powders with small quantities of boron carbide. The hardness of these compositions is in the range of the hardest conventional tungsten carbide-cobalt compositions. It was subsequently determined that molybdenum can be substituted for all the tungsten in the composition, and elemental boron can be substituted for the boron carbide with a minimum reduction in hardness. The composition can be used in high-pressure anvils; it sustains higher pressures than commercial carbides without plastic deformation
GRA

N81-30257# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ANALYTICAL ELECTRON-MICROSCOPY EVALUATION OF LASER-WELDED 308 STAINLESS STEEL
John M. Vitek and S. A. David 1981 20 p refs Presented at the Scanning Electron Microscopy Conf., Dallas, 14 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810410-3) Avail: NTIS HC A02/MF A01

Analytical electron microscopy (AEM) was used to characterize the structure of laser welded 308 stainless steel. Due to the small amounts and fine scale of the minor phases found in the laser welded material, AEM is unique in its ability to determine compositions accurately. The laser welded microstructure were different from those produced by more conventional techniques in that the amount of delta ferrite found in an austenite matrix was much lower (< 1% vs 10%). Additionally, a uniform distribution of amorphous Mn-Si rich precipitates was found. Compositions were determined as a function of both welding speed and postweld annealing. Results on specimens annealed after welding at 750 and 900 C indicated the equilibrium structure consisted of austenite plus delta ferrite. After annealing at higher temperatures (1060 C), both the ferrite and the Mn-Si particles dissolved, and instead, a Cr-Mn rich precipitate formed in small quantities (< 10%). This Cr-Mn precipitate was found to be fcc, with a sub 0 = 0.82 nm. DOE

N81-30258# Oak Ridge National Lab., Tenn.
HIGH-TEMPERATURE LOW-CYCLE FATIGUE AND TENSILE PROPERTIES OF HASTELLOY X AND ALLOY 617 IN AIR AND HTGR-HELIUM
J. P. Strizak, C. R. Brinkman, and P. L. Rittenhouse 1981 15 p refs Presented at IAEA Specialists Meeting on High-Temperature Materials for Application in Gas-Cooled Reactors, Vienna, 4 May 181
(Contract W-7405-eng-26)
(CONF-810530-4) Avail: NTIS HC A02/MF A01

Results of strain controlled fatigue and tensile tests are presented for two nickel base solution hardened alloys which are reference structural alloys for use in several high temperature gas cooled reactor concepts. These alloys, Hastelloy X and Inconel 617, were tested at temperature ranging from room temperature to 871 C in air and impure helium. Materials were tested in

the solution annealed as well as in the pre-aged condition where aging consisted of isothermal exposure at one of several temperatures for periods of up to 20,000 h. The strain controlled fatigue lives of these alloys and several other commonly used alloys all tested at 538 C are compared. DOE

N81-30259# Los Alamos Scientific Lab., N. Mex.
EVALUATION OF MOLYBDENUM AND ITS ALLOYS
Lynn B. Lundberg 1981 10 p refs Presented at 16th AIAA Thermophys. Conf., Palo Alto, Calif., 23-25 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1400) Avail: NTIS HC A02/MF A01

The choice of pure molybdenum as the prime candidate material for space reactor core heat pipes is critically examined. Pure molybdenum's high ductile-brittle transition temperature appears to be its major disadvantage. The candidate materials examined in detail for this application include low carbon arc-cast molybdenum, TZM-molybdenum alloy, and molybdenum-rhenium alloys. Published engineering properties are collected and compared, and it appears that Mo-Re alloys with 10 to 15% rhenium offer the best combination. Hardware is presently being made from electron beam melted Mo-13Re to test this conclusion. DOE

N81-30260# Rockwell International Corp., Golden, Colo. Energy Systems Group.
FABRICATING TUNGSTEN CRUCIBLES BY DRAWING AND EXTRUSION SPINNING
Carl M. Edstrom 25 Apr. 1981 11 p
(Contract DE-AC04-76DP-03533)
(RFP-3049) Avail: NTIS HC A02/MF A01

The fabrication of seamless tungsten crucibles 127-mm ID x 265 mm high x 6.25-mm wall thickness (5 in. x 10 1/2 in. x 1/4 in.) involved three drawing operations and extrusion spinning. The success of the drawing operations came from a combination of low draw reduction percentage, generous draw radii, large punch-to-die clearance, and attention to drawing temperature. The extrusion spinning success related to good drawn-cup-to-spinning-mandrel fit prior to making the extrusion passes, removal of stress risers in the part prior to spinning, and special attention to part and mandrel temperature. DOE

N81-30261# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ALUMINA-SCALE ADHERENCE TO CoCrAl ALLOYS AND COATINGS
D. P. Whittle and D. H. Boone Apr. 1981 19 p refs Presented at the 7th LBL/MMRO Intern. Mater. Symp., 17th Univ. Conf. on Ceram., Surfaces and Interfaces in Ceram. and Ceram.-Metal Systems, Berkeley, Calif., 28-30 Jul. 1980
(LBL-12421) Avail: NTIS HC A02/MF A01

The behavior of a number of CoCrAl alloys and coatings containing different active element additions was examined. All the compositions studied contain more than sufficient Al to ensure rapid, initial formation of a protective Al2O3 scale and as a consequence, attention is focussed on the scale substrate adhesion, rather than the development of the initial protective oxide. DOE

N81-30262# Oak Ridge National Lab., Tenn. Metal and Ceramics Div.
SOLIDIFICATION BEHAVIOR AND MICROSTRUCTURAL ANALYSIS OF AUSTENITIC STAINLESS STEEL LASER WELDS
S. A. David and J. M. Vitek 1981 8 p refs Presented at the 110th Ann. Meeting of the AIME, Chicago, 22 Feb. 1981
(Contract W-7405-eng-26)
(CONF-810203-13) Avail: NTIS HC A02/MF A01

Solidification behavior of austenitic stainless steel laser welds was investigated with a high-power laser system. The welds were made at speeds ranging from 13 to 60 mm/s. The welds sowed a wide variety of microstructural features. The ferrite content in the 13-mm/s weld varied from less than 1% at the root of the weld to about 10% at the crown. The duplex structure at the crown of the weld was much finer than the one observed in conventional weld metal. However, the welds made at 25 and 60 mm/s contained an austenitic structure with less than 1% ferrite through-out the weld. Microstructural analysis of these welds used optical microscopy, transmission electron microscopy, and analytical electron microscopy. The austenitic stainless steel welds were free of any cracking, and the results are explained in terms of the rapid solidification conditions during laser welding. DOE

N81-30263# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
OXIDATION MECHANISMS FOR ALLOYS IN SINGLE-OXIDANT GASES
D. P. Whittle Mar. 1981 45 p refs Presented at the Intern. Conf. on High Temp. Corrosion, San Diego, Calif. 2-6 Mar. 1981
(Contract W-7405-eng-48)
(LBL-12614; CONF-810347-2) Avail: NTIS HC A03/MF A01

Scales formed on alloys invariably contain the alloy constituents in a ratio different from that in the alloy, owing to the differing thermodynamic tendencies of the alloy components to react with the oxidant and to differences in diffusion rates in scale and alloy phases. This complex interrelationship between transport rates and the thermodynamics of the alloy oxidant system are analyzed using multicomponent diffusion theory when transport controlled growth of single or multi-layered scales occurs. The superimposition of the diffusion data on an isothermal section of the appropriate phase diagram indicates the likely morphologies of the reaction products, including the sequence of phases found in the scale, the occurrence of internal oxidation and the development of an irregular metal/scale interface. DOE

N81-30264# Argonne National Lab., Ill. Materials Science Div.
RADIATION-INDUCED SEGREGATION IN COMPLEX ALLOYS
V. K. Sethi and P. R. Okamoto 1980 15 p refs Presented at the TMS-AIME Symp. on Irradiation Phase Stability, Pittsburgh, 5-9 Oct. 1980
(Contract W-31-109-eng-38)
(CONF-801072-6) Avail: NTIS HC A02/MF A01

The segregation of alloying elements to the surface during 3 MeV Ni-58(+) ion bombardment was investigated in alloys of Fe-200Cr-12Ni (at. %) containing controlled additions of Si and Mo. The segregation profiles, determined by Auger electron spectroscopy, show that Ni and Si are enriched, while Cr and Mo are depleted at the irradiated surfaces. The data indicate that the segregation of Ni and Cr are affected by the presence of Mo and Si in the alloy. However, no obvious trends are observed as a function of the minor solute element concentration The temperature dependence of the RIS of the alloying elements was also investigated. The void swelling data on these alloys is also presented as a function of temperature and composition Additions of Si reduce the swelling by affecting both the nucleation and the growth of the voids. The peak swelling temperature for all the alloys containing minor solutes are found to be lower than that of the base alloy. DOE

N81-30265# Ames Lab., Iowa.
CHARACTERIZATION OF THE PROTONIC DISTRIBUTION AND ENVIRONMENT IN AMORPHOUS SILICON-HYDROGEN ALLOYS USING PROTON NMR AND ESR
F. R. Jeffrey, M. E. Lowry, M. L. S. Garcia, R. G. Barnes, and D. E. Torgeson 1981 7 p refs Prepared in cooperation with Iowa State Univ. of Science and Technology, Ames
(Contract W-7405-eng-82)
(IS-M-325) Avail: NTIS HC A02/MF A01

Magnetic resonance data were collected from a series of a-Si(H) samples deposited under varied hydrogen partial pressures. This parameter were shown to be directly related to the sample-wide average proton density. The other sputtering parameters were maintained such that no dihydride bonding (as determined by the 890/cm ir bending mode) is present Measurements presented are the NMR absorption spectrum (from the Fourier transform of the free induction decay), relaxation time T1, and ESR absorption. The NMR absorpton spectrum identifies two distinct forms of H incorporation. One is a tightly cluster form, such as H bonded on the inner surface of a microvoid of maximum dimension 5A, while the other is a randomly distributed phase with local H density of 3.5 x 10 sub cm-3

The distributed phase H density is independant of the sample-wide average, indicating a fixed composition phase which occupies a larger percentage of the sample as H pressure is increased during deposition. DOE

N81-30266# California Univ., Berkeley. Lawrence Berkeley Lab. Chemical Biodynamics Div.
SPECTROSCOPIC STUDIES OF MOLYBDENUM COMPLEXES AS MODELS FOR NITROGENASE Ph.D. Thesis
Timothy Paar Walker May 1981 130 p refs
(Contract W-7405-eng-48)
(LBL-12823) Avail: NTIS HC A07/MF A01

Inorganic dinitrogen and hydride complexes of molybdenum which mimic the reactions of nitrogen-fixing enzymes are investigated. It is shown that in aqueous solution the cysteine ligands assume at least three distinct configurations. A step-wise dissociation of the cysteine ligand is proposed to explain the data. The Extended X-ray Absorption Fine Structures (EXAFS) are described. The spectra are fitted to amplitude and phase parameters. On the basis of this analysis, one can determine (1) that the dinitrogen complex contains nitrogen and the hydride complex does not and (2) the correct Mo-N distance. This is significant because the Mo in both complexes is coordinated by four P atoms which dominate the EXAFS. A similar sort of interference is present in nitrogenase due to S coordination of the Mo in the enzyme. Dinitrogen coordination to Mo in the enzyme is determined by EXAFS using existing data analysis techniques. DOE

N81-30267# DSM/nv Nederlandse Staatsmijnen, Geleen. Central Lab.
METAL SURFACE AREA AND METAL DISPERSION IN CATALYSTS
J. J. F. Scholten 9 Mar. 1978 23 p refs Presented at 2nd Intern. Symp. on the Sci. Basis of Catalyst Preparation, Louvain-la-Neuve, Belgium, 4-6 Sep. 1978
(MS-1251) Avail: NTIS HC A02/MF A01

Methods for the determination of free-metal surface areas are surveyed. Iron, copper, silver, gold, nickel, cobalt, palladium and platinum (but not alloy catalysts) are considered. Recommendations are made with respect to the choice of the adsorbate, the measuring technique and data interpretation. Techniques for the adsorption of carbon monoxide on a singly promoted ammonia synthesis catalyst, the adsorptive decomposition of nitrous oxide, oxygen chemisorption, hydrogen chemisorption and hydrogen-oxygen titration are described. The effects due to the condition of the metal surface after pre-treatment, the presence of impurities, and the non-inert nature of the support are considered. Formulas used in X-ray and electron microscope techniques for particle detection, when determining dispersion and mean particle size, are considered. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N81-30268 Virginia Polytechnic Inst. and State Univ., Blacksburg.
ON THE DEVELOPMENT OF AN AUTOMATED INSTRUMENT, DESIGNED AROUND A SURFACE ACOUSTIC WAVE (SAW) PROBE, FOR THE THERMOMECHANICAL CHARACTERIZATION OF SELECTED POLYMERS Ph.D. Thesis
John A. Groetsch, III 1980 200 p
Avail: Univ. Microfilms Order No. 8116793

Polymer testing methods frequently involve lengthy analysis times and extensive sample preparation. Sensitive to (only) bulk responses in the sample, some classical testing methods are limited to the analyses of sample whose moduli fall within a well defined range. The SAW technique offers rapid analyses of both cast film and thin film samples, with sample preparation times, typically, less than five minutes. The SAW data indicate that the mechanical character of the specimen can be followed in cast films while specimen rheological character can be monitored in thin films. The SAW technique has proven to be an effective surface monitor. Separate analyses of the surface layer of laminates were affected. In addition, surface treated Lexans were studied indicating degree of plasticizer enrichment at the surface. Support electronics and system software are presented. Suspected SAW/sample interactions mechanisms are discussed. Dissert. Abstr.

N81-30269 Connecticut Univ., Storrs.
STUDIES OF KINETICS AND EQUILIBRIA OF THE SWELLING OF ORGANIC COLLOIDS USING LIGHT SCATTERING Ph.D. Thesis
Shu-Jan Liang 1981 156 p
Avail: Univ. Microfilms Order No. 8116743

Monodisperse, aqueous colloids of polystyrene, poly (methylacrylate) and dioctyl disulfide were prepared. The kinetics of the swelling of these colloids were studied in aqueous solutions of tetrahydrofuran and p-dioxane at various concentrations. The size of the colloidal particles was continuously determined during the swelling process by monitoring the light scattering at 90 deg of periodically measuring the angular dependence of the scattering intensity. Particle sizes are those computed by means of the full Mie equations, taking into account the change in refractive index due to solvent imbibition. The swelling equilibria exhibited the polystyrene latex particles are discussed in terms of the Fiory-Huggins interaction parameter and the activity of the solvent in the aqueous solution. The presence of water in the swollen THF polystyrene particles has a large effect on the thermodynamic properties of the system which, in turn, has a pronounced effect on the swelling equilibrium. Dissert. Abstr.

N81-30270*# Southwest Research Inst., San Antonio, Tex.
NONLINEAR VISCOELASTIC CHARACTERIZATION OF THIN POLYETHYLENE FILM Final Report
James S. Wilbeck Jul. 1981 54 p refs
(Contract NAS6-3077)
(NASA-CR-156876) Avail: NTIS HC A04/MF A01 CSCL 07C

In order to understand the state of stress and strain in a typical balloon fabricated from thin polyethylene film, experiment data in the literature reviewed. It was determined that the film behaves as a nonlinear viscoelasticity material and should be characterized accordingly. A simple uniaxial, nonlinear viscoelastic model was developed for predicting stress given a certain strain history. The simple model showed good qualitative agreement with results of constant rate, uniaxial accurately predicting stresses for cyclic strain histories typical of balloon flights. A program was outlined which will result in the development of a more complex nonlinear viscoelastic model. Author

N81-30271# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymer Branch.
THE SYNTHESIS AND ISOTHERMAL AGING BEHAVIOR OF OXYGEN-FREE ACETYLENE Final Technical Report, Jan. 1979 - Dec. 1980
Frederick L. Hedberg and Fred E. Arnold May 1981 19 p refs
(AF Proj. 2419)
(AD-A101638; AFWAL-TR-81-4004) Avail: NTIS HC A02/MF A01 CSCL 11/9

Acetylene-terminated resins prepared to date have contained phenyl ether groups, limiting their thermooxidative stability to 315 C, as determined by isothermal aging in air. In order to determine whether the thermo-oxidative stability of the acetylene cure site exceeds 315 C, a series of three acetylene-terminated quinoxaline isomer mixtures containing only aromatic and quinoxaline rings, known to have 371 C stability, were prepared and their isothermal aging behavior in air was studied at 315 C, 343 C, and 371 C. The thermooxidative stability of one system was comparable with that of an analogous acetylene terminated quinoxaline which contained phenyl ether linkages. The other two systems, which both contained ethynyl groups directly bonded to a quinoxaline ring, showed poorer thermo-oxidative stability than a phenyl ether containing system.
Author (GRA)

N81-30272# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
MICROSTRUCTURE AND NONLINEAR VISCOELASTICITY IN ORIENTED POLYPROPYLENE Final Report

Jeanne L. Courter and David K. Roylance Jan. 1981 175 p refs
(Contract N00014-76-C-0846)
(AD-A101521) Avail: NTIS HC A08/MF A01 CSCL 11/9

Oriented semicrystalline polymers do not show linear viscoelastic mechanical behavior in useful ranges of strain. The relationship of the nonlinear viscoelasticity of the stress relaxation modulus to microstructural features, including crystallinity, crystalline orientation and amorphous orientation, was examined using oriented polypropylene film. The microstructure was altered by annealing in such a way that crystallinity and crystalline orientation were kept constant. Birefringence and sonic modulus were used to measure amorphous orientation. The strain dependence of the isochronal stress relaxation modulus and the amorphous orientation were then compared for unannealed and annealed films. By controlling crystallinity and crystalline orientation, structural changes required to cause changes in nonlinear behavior may have been prevented. The structural change caused by annealing was not a simple retraction of amorphous material, as evidenced by an increase in amorphous orientation. It is proposed that, upon annealing, microfibrillar motion and increased lamellar perfection cause a reduction in crystal-crystal connections and an increase in crystal-amorphous connections along the draw direction, thereby decreasing the modulus. GRA

N81-30273# General Electric Co., Schenectady, N. Y. Research and Development Center.
THEORETICAL EVIDENCE FOR SPECIFICITY OF METAL-METALLOID INTERACTIONS IN Fe-Ni-P-B GLASSES
R. P. Messmer 1980 5 p refs Presented at Conf. on Metallic Glasses: Sci. and Technol., Budapest, Jun. 1980
(Contract DE-AC02-79ER-10382)
(CONF-8006158-1) Avail: NTIS HC A02/MF A01

Detailed quantum mechanical calculations carried out on clusters of atoms which simulate possible local environments in amorphous metal alloys are considered. Clusters based on simple Bernal polyhedra and distortions of these polyhedra are used. The materials studied are the (Fe, Ni, B, P) alloys. The simplest Bernal polyhedron, the tetrahedron, is considered as a first model for the local environment in Fe40Ni40B20 and Fe40Ni40P20 alloys. DOE

N81-30274# Oak Ridge National Lab., Tenn.
CERAMIC RAW MATERIALS AND THEIR MANAGEMENT
H. E. Goeller 1981 24 p refs Presented at the 83rd Symp. on Nucleation and Crystallization in Glasses, Washington, D.C., 3-6 May 1981
(Contract W-7405-eng-26)
(CONF-810528-2) Avail: NTIS HC A02/MF A01

After defining reserves and resources with particular emphasis on the need to pay special attention to qualifications, it was pointed out that about a dozen elements are already in near infinite supply and that through appropriate reseach and process development, another dozen may eventually achieve this status. At the other extreme are the elements obtained only as by products from ores; the importance of husbanding them was stressed, including the need for stockpiling them. Impending scarcity of the remaining limited elements was discussed in terms of resource to demand ratios, which, through only marginally adequate as a measure of impending scarcity, is the only index we presently have. Alternative resources were then discussed as a panacea for extending resources for some elements but definitely not for all. DOE

N81-30275# California Univ., Berkeley. Lawrence Berkeley Lab.
FAILURE MODES OF NA-BETA ALUMINA
Lutgard C. DeJonghe, L. Feldman, and A. Buechele Apr. 1981 6 p refs Presented at the Intern. Conf. on Fast Ionic Transport in Solids Gatlinburg, Tenn., 18-22 May 1981 Submitted for publication
(Contract W-7405-eng-48)
(LBL-12445; CONF-810566-2) Avail: NTIS HC A02/MF A01

Sodium-beta and beta alumina solid electrolytes may, under certain conditons, degrade when used in sodium/sulfur cells. Degradation of sodium-beta alumina can take two forms: Mode 1 and Mode 2. Mode 1 is the well documented electro-mechanical propagation of a preexisting microcrack in the surface of the electrolyte. The critical electrode current densities, j(sub crit), were determined below 100 C using acoustic emission detection during electrolysis. The temperature dependence and magnitudes of j indicate that the applied voltage is an important factor. Mode 2, a degradation involving internal sodium formation is briefly reviewed. DOE

N81-30276# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
SIMPLE METHOD FOR ADHESION MEASUREMENTS
S. S. Chiang, D. B. Marshall, and A. G. Evans Aug. 1980 17 p refs Presented at the Surfaces and Interfaces in Ceram. and Ceram.-Metal Systems Conf., Berkeley, Calif., 28 Jul. - 1 Aug. 1980 Prepared in cooperation with California Univ., Berkeley
(Contracts W-7405-eng-48; N00014-79-C-0159)
(LBL-11668; CONF-800765-6) Avail: NTIS HC A02/MF A01

An indentation method for determining the adhesion of interfaces between thin films and substrates was developed. The method provides a quantitative measure of the interface fracture resistance and has the advantage of simplicity and reproducibility. The method is demonstrated for a range of ZnO/Si sytems and the adherence is correlated with acoustic properties. DOE

N81-30277# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
MEASUREMENT AND THEORETICAL CALCULATION OF QUENCH VELOCITIES WITHIN LARGE FULLY EPOXY-IMPREGNATED SUPERCONDUCTING COILS
P. H. Eberhard, G. H. Gibson, M. A. Green, E. Grossman, R. R. Ross, and J. D. Taylor Mar. 1981 6 p refs Presented at the 7th Intern. Conf. on Magnet Technol., Karlsruhe, West Germany, 30 Mar. - 3 Apr. 1981
(Contract W-7405-eng-48)
(LBL-12337; CONF-810340-12) Avail: NTIS HC A02/MF A01

The velocity of normal region propagation was measured in a 2-m diameter superconducting coil. An adiabatic quench propagation theory, which takes into account the properties of both the superconductor and the matrix material and which assumes there is no heat transfer out of the wire, was found to agree with the experimental measurements. Both the theory and experimental measurements are given. DOE

N81-30278# Falcon Research and Development Co., Buffalo, N. Y.
EVALUATION OF STATISTICAL PROCEDURES FOR GRADING FUEL EFFICIENT ENGINE OILS Final Report
S. Kaufman, H. T. McAdams, and N. Morse Nov. 1980 78 p refs
(Contract EPA-68-03-2835)
(PB81-188930; EPA-460/3-81-012; Rept-3520-2/BUF-40) Avail: NTIS HC A05/MF A01 CSCL 11H

In March 1980 the EPA distributed for industry comment at draft 'EPA Recommended Practice for Evaluating, Grading, and Labeling the Fuel Efficiency of Motor Vehicle Engine Oils'. The EPA request Falcon Research and and Development Co. to 'analyze comments received...with regard to the recommended statistical procedure'. As a follow up effort, Falcon was requested to provide an independent assessment of certain aspects of the proposed statistical procedure. Particular areas identified for consideration were: (1) comparative accuracy of carryover and non-carryover effect procedures; (2) means for encouraging (rewarding) accurate testing; (3) dealing with outliers in fuel economy test data; and (4) the impact of variability in oil effects across car models on the meaningful grading of oils. An investigation of these areas, and cursory examination of some additional topics form the subject of this report. GRA

N81-31101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECYCLING USED LUBRICATING OIL AT THE DEEP SPACE STATIONS
J. L. Koh *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 239-246 refs (For primary

document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 07D

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N81-30279*# Billings Energy Corp., Independence, Mo.
HYDROGEN FROM COAL COST ESTIMATION GUIDEBOOK
Roger E. Billings [1981] 274 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955261)
(NASA-CR-164692; JPL-955-578) Avail: NTIS HC A12/MF A01 CSCL 21D

In an effort to establish baseline information whereby specific projects can be evaluated, a current set of parameters which are typical of coal gasification applications was developed. Using these parameters a computer model allows researchers to interrelate cost components in a sensitivity analysis. The results make possible an approximate estimation of hydrogen energy economics from coal, under a variety of circumstances. T.M.

N81-30280*# United Technologies Research Center, East Hartford, Conn.
DEPOSIT FORMATION IN HYDROCARBON ROCKET FUELS Final Progress Report, Apr. 1980 - May 1981
Richard Roback, Eugene J. Szetela, and Louis J. Spadaccini Aug. 1981 138 p refs
(Contract NAS3-22277)
(NASA-CR-165405; R81-915216-1) Avail: NTIS HC A07/MF A01 CSCL 21I

An experimental program was conducted to study deposit formation in hydrocarbon fuels under flow conditions that exist in high-pressure, rocket engine cooling systems. A high pressure fuel coking test apparatus was designed and developed and was used to evaluate thermal decomposition (coking) limits and carbon deposition rates in heated copper tubes for two hydrocarbon rocket fuels, RP-1 and commercial-grade propane. Tests were also conducted using JP-7 and chemically-pure propane as being representative of more refined cuts of the baseline fuels. A parametric evaluation of fuel thermal stability was performed at pessures of 136 atm to 340 atm, bulk fuel velocities in the range 6 to 30 m/sec, and tube wall temperatures in the range 422 to 811 K. Results indicated that substantial deposit formation occurs with RP-1 fuel at wall temperatures between 600 and 800 K, with peak deposit formation occurring near 700 K. No improvements were obtained when deoxygenated JP-7 fuel was substituted for RP-1. The carbon deposition rates for the propane fuels were generally higher than those obtained for either of the kerosene fuels at any given wall temperature. There appeared to be little difference between commercial-grade and chemically-pure propane with regard to type and quantity of deposit. Results of tests conducted with RP-1 indicated that the rate of deposit formation increased slightly with pressure over the range 136 atm to 340 atm. Finally, lating the inside wall of the tubes with nickel was found to significantly reduce carbon deposition rates for RP-1 fuel. Author

N81-30281# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
RELATIONSHIPS BETWEEN THE IMPACT SENSITIVITY OF HIGH ENERGY COMPOUNDS AND SOME MOLECULAR PROPERTIES WHICH DETERMINE THEIR PERFORMANCE; N, M, AND RHO
H. G. Adolph, J. R. Holden, and D. A. Cichra 9 Apr. 1981 53 p refs
(AD-A101203; NSWC/TR-80-495) Avail: NTIS HC A04/MF A01 CSCL 19/1

Correlations have been carried out between several parameters related to the sensitivity and performance of several classes of nitro explosives. The parameters include experimental impact sensitivities and crystal densities, and the calculated quantities Q (detonation energy), sq. root of NM (a characteristic of the detonation gas), and NO2 (nitro content). Significant positive trends have been observed for correlations of impact sensitivity (I.S.) with NO2, crystal or initial density and sq root of NM and of NO2 with crystal or initial desity and sq root of NM for series of polynitroaliphatic compounds and nitramines. The trends in I.S. with sq root of NM and crystal or initial density appear to be influenced by the dependence of all 3 parameters on the NO2. Delta rho, and increment of exceptional density, is independent of I.S. or may decrease it slightly. By contrast, in a series of polynitroaromatic compounds the only correlations exhibiting significant trends are between I.S. and NO2.
Author (GRA)

N81-30282# Radian Corp., Austin, Tex.
CHROMATOGRAPHIC SEPARATION OF CONVENTIONAL AND EXPERIMENTAL FUELS Final Technical Report, Sep. 1979 - Jun. 1980
Karl J. Bombaugh, Donald H. Rodgers, and John C. Beltz Oct. 1980 57 p
(Contract F33615-79-C-2083; AF Proj. 2303)
(AD-A101673; RAD-219-030-03; AFWAL-TR-80-2098) Avail: NTIS HC A04/MF A01 CSCL 21/4

This research was performed in order to develop a chromatographic method for the separation and isolation of the various classes of hydrocarbons present in conventional and experimental aircraft fuels. The objective of such a technique is to provide a convenient means of estimating the relative proportions of the hydrocarbon classes, i.e., normal and branched alkanes, alkylbenzenes, alkenes, etc., and to render the initially complex fuels tractable to conventional methods of analysis and characterization. The procedure developed consists of a semi-preparative column chromatographic method, using spherical particulate silica gel column packing and isobutane as the mobile phase. The fuel samples are fractionated by passing them through the column and collecting the eluting fractions at regular intervals. The volatile isobutane carrier is evaporated from the fractions and the residues are analyzed by techniques such as gas chromatography. Because the isobutane vaporizes quantitatively at low temperatures, the fractions are obtained free of interfering solvent. In this respect, the technique is novel and unprecedented. Results of the analyses show that the method provides good separation of aliphatic and aromatic hydrocarbons, and partial resolution of aliphatic and olefinic hydrocarbons. Resolution may be improved substantially by optimizing the column temperature and by using low-boiling mobile phases of varying polarity. GRA

N81-30283# Ballistic Research Labs., Aberdeen Proving Ground, Md.
BURNING RATE OF PRESSED STRANDS OF A STOICHIOMETRIC MAGNESIUM-SODIUM NITRATE MIX
Leon J. Decker, Austin W. Barrows, and J. Richard Ward Mar. 1981 23 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A101700; AD-E430640; ARBRL-MR-03096) Avail: NTIS HC A02/MF A01 CSCL 19/1

The burning rate of pressed strands made from a stoichiometric mix of magnesium and sodium nitrate was measured in nitrogen over the pressure range 0.1 to 8.6 MPa. A plot of the logarithm of burning rate vs logarithm of pressure reveals two distinct regions with the 'slope break' occurring near 2 MPa. At the lower pressures, the slope is 0.3; at higher pressures, the slope is 0.05. The burning rate measured at 3.4 MPa was unchanged when oxygen replaced nitrogen; thus, gas-phase reactions do not affect the burning rate. GRA

N81-30284# Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.
HYDRODYNAMICS OF COAL-LIQUEFACTION DISSOLVER CONFIGURATIONS
C. F. Irwin, A. J. Sincali, and E. W. Wong Jun. 1981 72 p refs
(Contract W-7405-eng-26)
(ORNL/MIT-326) Avail: NTIS HC A04/MF A01

The hydrodynamics of two proposed dissolver configurations for the 63.6 kg/s (6000 tpd) SRC-I demonstration plant were examined. Correlations were used to predict the flow patterns, holdups, pressure drops, bubble size distribution, and axial mixing

in the dissolvers and piping. Calculations on the performance of dissolver internals revealed slug flow and related pressure fluctuations may present serious control problems. The dissolver internals will be subject to extreme erosion by solids. Hydrogen mass transfer in the bubbly flow regime, expected in the dissolver, is not rate limiting. Liquid axial mixing is significant and will affect the conversion and selectivity. It is recommended that the pressure fluctuations be estimated by dynamic modeling, that the internals be redesigned to reduce the potential for erosion and coking, that the validity of the assumptions be evaluated at system temperature and pressure, and that experimental programs be initiated to correlate flow patterns, gas holdups, and axial dispersion in large diameter pipes and columns with high gas densities and in the presence of solids. DOE

N81-30285# Decision Analysis Corp., Annandale, Va.
ANALYSIS OF ALTERNATIVE-FUEL PRICE TRAJECTORIES
31 Dec. 1980 84 p refs
(Contract DE-AC01-80RG-10446)
(DOE/RG-10446/T1) Avail: NTIS HC A05/MF A01

Findings are presented from a study to acquire, analyze, and report alternative published price projections including both oil and coal price trajectories. Comparisons of key assumptions underlying the price projections are reported and the applicability of the fixed annuity formula as used in the alternative cost calculation is demonstrated. Graphic presentations of all updated coal and oil price forecasts are included. DOE

N81-30286# Sandia Labs., Albuquerque, N. Mex.
PROCESS FOR EXTRACTING USEFUL, PRIMARILY COMBUSTIBLE GASES, BY IN-SITU GASIFICATION OF UNDERGROUND FOSSIL-FUEL BEDS
P. Ljuengstroem Feb. 1981 7 p Transl. into ENGLISH of Swedish Patent no. 130,291 (Appl. no. 8536/1946, 30 Sep. 1946)
(SAND-81-6003) Avail: NTIS HC A02/MF A01

A process is described for overcoming shortcomings, so that the calorie content of the fuel beds can be recovered in a work-saving and economically favorable manner, even if the fuel-bearing beds lie deep under the surface or are not very thick. A smaller portion of the fuel bed is heated electrically and thus brought into a gas-permeable state, whereupon this portion is used to introduce oxygen (air) through the fuel bed, as well as to remove the gases generated by burning the remaining portion of the fuel bed. The process according to the invention is carried out by drilling a group of holes down from the ground surface and inserting electric heating elements in some of them. They feed electrical energy into the fuel bed and induce heating, which creates an advancing front of porous fuel mass. Oxygen (air) is then introduced through one or more of the holes in the group so that the surrounding zones of the fuel bed are made to burn and the combustible gases generated are removed through one of more of the other holes in the group. DOE

N81-30287# Los Alamos Scientific Lab., N. Mex.
EUTECTIC COMPOSITE EXPLOSIVES CONTAINING AMMONIUM NITRATE
Mary M. Stinecipher 1981 11 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-917; CONF-810602-11) Avail: NTIS HC A02/MF A01

The eutectic of ammonium nitrate (AN), the ammonium salt of 3,5-dinitro-1,2,4-triazole was prepared and its sensitivity and performance were studied. It was found that this AN formulation was unusual in that it performed ideally at small diameter, which indicated that it was a monomolecular explosive. Sensitivity tests included type 12 impact, Henkin thermal and wedge tests, and performance tests included rate stick/plate dent, cylinder, and aquarium tests. Results were compared with calculations, standard explosives, and another eutectic, ethylendiamine dimitrate (EDD)/AN. DOE

N81-30288# Los Alamos Scientific Lab., N. Mex.
FINE STRUCTURE IN NITROMETHANE/ACETONE DETONATIONS
William C. Davis 1981 7 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-704; CONF-810602-8) Avail: NTIS HC A02/MF A01

Dark waves in the detonation front of nitromethane/acetone mixtures, were photographed using pairs of image intensifier cameras, triggered at slightly different times. The photographs show the motions and changes of the complex wave structure. Intriguing results are that the average brightness doesn't change as much from center to edge as simple theory would predict, and brightness goes down rather than up when a reflected shock from a glass plate enters the explosive products. The structure remains visible in the products stagnated against a glass plate, showing that the bright regions are high temperature regions, not just areas where less absorbing material is present ahead of the emitting layer. DOE

N81-30289# Los Alamos Scientific Lab., N. Mex.
INITIATION TRANSIENT IN DILUTE EXPLOSIVES
Wildon Fickett 1981 10 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-705; CONF-810602-7) Avail: NTIS HC A02/MF A01

The initial transient in plane-shock initiation in a dilute explosive was studied where the chemical energy is small relative to the mechanical thermal energy. The vehicle for the study was the mathematical analog for reactive flow. The solution resembled a double refraction, to first order, the pressure or density was a superposition of two forward going waves, both originating at the rear boundary, and carrying the same function, but running at different velocities. Surprisingly, this first order solution was independent of the sensitivity of the reaction rate to the state, which appears only at second order. DOE

N81-30290# Los Alamos Scientific Lab., N. Mex.
NONIDEAL DETONATION AND INITIATION BEHAVIOR OF A COMPOSITE-SOLID ROCKET PROPELLANT
J. J. Dick 1981 5 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-706; CONF-810602-10) Avail: NTIS HC A02/MF A01

An HMX/AP/Al rocket propellant was studied. Low detonation velocities and unusual shock initiation behavior were observed. Failure to propagate steady detonation in cylinders of the propellant was also noted. DOE

N81-30291# Los Alamos Scientific Lab., N. Mex.
SHOCK INITIATION OF POROUS TATB
Allan B. Anderson, M. J. Ginsberg, W. L. Seitz, and Jerry Wackerle 198[illegible] 10 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-871; CONF-810602-20) Avail: NTIS HC A02/MF A01

The planar shock initiation of 1.8 g/cu cm TATB was studied with embedded Manganin pressure gauges and with the explosive wedge technique. A Lagrangian analysis and an assumed equation of state were used to determine reaction histories during the initiation process. Correlation of reaction rates to state variables resulted in a shock strength modified Arrhenius rate law. Numerical simulations employing the rate law have been performed for a number of initiation experiments on TATB. DOE

N81-30292# Los Alamos Scientific Lab., N. Mex.
CUSTOMIZED EXPLOSIVES BASED ON PLASTIC-BONDED MIXTURES OF TATB AND HMX
A. W. Campbell, H. L. Flaugh, A. Popolato, and J. B. Ramsay 1981 9 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 81
(Contract W-7405-eng-36)
(LA-UR-81-872; CONF-810602-19) Avail: NTIS HC A02/MF A01

Experimental data are presented for a series of TATB-HMX mixtures with Kel-F 800 binder. Both detonation properties and safety properties were evaluated. The addition of HMX to TATB makes possible a wide range in such properties as specific energy.

detonation velocity and divergence, failure diameter and handling safety. This flexibility is not without penalty however. The sensitivity of TATB-HMX mixtures increased rapidly with increasing HMX content, even at relatively low levels of HMX and some tradeoff must be made between detonation properties and safety. DOE

N81-30293# Oak Ridge National Lab., Tenn.
OVERVIEW OF COAL CONVERSION
Bruce R. Clark 27 Mar. 1981 25 p Presented at the 70th Two Year College Chemistry Conf., Atlanta, 27 Mar. 1981
(Contract W-7405-eng-26)
(CONF-810362-1) Avail: NTIS HC A02/MF A01

The structure of coal and the processes of coal gasification and coal liquefaction are reviewed. Coal conversion technology is examined as a possible vehicle in providing a significant amount of synthetic fuel within the next few years. Particular emphasis is given to the efforts of both government and private sectors in the development of this technology to hedge against ever diminishing petroleum supplies, especially from foreign sources. The reactions of coal products, and the physics and chemistry involved in the various stages of coal conversion processes are also considered. DOE

N81-30294# Midwest Research Inst., Golden, Colo.
DEMONSTRATION OF DISSOCIATED METHANOL AS AN AUTOMOTIVE FUEL: SYSTEM PERFORMANCE
J. G. Finegold, M. E. Karpuk, J. T. McKinnon, and R. Passamaneck Apr. 1981 5 p refs Presented at Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26 May 1981
(Contract DE-AC02-77CH-00178)
(SERI/TP-731-1178; CONF-810509-26) Avail: NTIS HC A02/MF A01

Testing of a system for providing hydrogen rich gases to an internal combustion engine is described. The endothermic dissociation of methanol on board the vehicle is described. The dissociation of methanol absorbs heat from the engine exhaust and increases the lower heating value of the fuel by 22%. The engine thermal efficiency is increased by raising the compression ratio and burning with excess air. Higher vehicle efficiency than that of cars burning pure alcohol or alcohol blends is obtained. DOE

N81-30295# Los Alamos Scientific Lab., N. Mex.
PRECURSORS IN DETONATIONS IN POROUS EXPLOSIVES
Robert L. Spaulding, Jr. 1981 11 p refs Presented at the 7th Symp. on Detonation, Annapolis, 16-19 1981
(Contract W-7405-eng-36)
(LA-UR-81-865; CONF-810602-22) Avail: NTIS HC A02/MF A01

Photographs of detonation waves in low density HMX and PETN, made with an image intensifier camera, show a brilliant band of light in front of the pressure jump. The radiation temperature is estimated to be 12,000 to 14,000 K. The spectrum of this light is continuous. A quartz gauge shows a gradual buildup of pressure from the material producing the light. The material has little effect on the propagation of detonation. Further observations, using pellets of plastic bonded HMX and single crystals of PETN, show that the material thrown off the free surface is transparent, with a leading edge moving at approximately 20 mm/microsec. Collision of this material with polymethyl methacrylate (PMMA) produces a brilliant light with a spectrum that is initially a narrow H sub alpha line. Quartz gauges measure the rate of pressure buildup of this material. DOE

N81-30296# Oak Ridge National Lab., Tenn. Fossil Energy Program Office.
PYROLYSIS AND PHYSICAL PROPERTIES OF COAL BLOCKS
P. R. Westmoreland, R. C. Forrester, and J. B. Gibson Jun. 1981 186 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7313) Avail: NTIS HC A09/MF A01

Interactions between the various physical properties of coal and its pyrolysis were characterized by studying the heating of 150-mm-diameter cylindrical blocks of Wilcox lignite, Wyodak subbituminous coal, Hanna bituminous coal, and Pittsburgh bituminous coal. In the various coals, block pyrolysis caused gasification and cracking reactions and changes in char reactivity and in swelling, none of which is observed in powder pyrolysis. These changes were interpreted as having resulted from internal temperature gradients and flow patterns. To aid in an evaluation of this interpretation, physical and transport properties of coals were reviewed, measured, and correlated. Data on thermal diffusivity and conductivity of lignite were of particular interest. DOE

N81-30297# KVB, Inc., Irvine, Calif.
COMBUSTION AND EMISSION CHARACTERISTICS OF COAL-DERIVED LIQUID FUELS Interim Report
L. J. Muzio and J. K. Arand Jun. 1981 142 p refs
(EPRI-AP-1878) Avail: NTIS HC A07/MF A01

A number of coal liquefaction processes have reached a state of development where limited quantities of the fuels are becoming available for testing. An experimental study was conducted to determine their combustion and emission characteristics. In particular, the tests sought to determine: (1) the effect of compositional changes on the combustion and emission characteristics; and (2) the relative combustion characteristics of the fuels produced from the various processes. The experimental facility was an 80-HP boiler modified to simulate large utility boilers. The following combustion parameters were investigated: excess air level; combustion air preheat; single stage and two stage combustion; fuel viscosity; and atomization. The performance of the coal liquids was compared to No. 2 petroleum oils. The coal liquids tested: SRC-II, H-Coal, and EDS distillates, can be handled and atomized similarly to No. 2 petroleum oils. DOE

N81-30298# Department of Energy, Chicago, Ill.
GASOHOL BY DIRECT EXTRACTION OF AQUEOUS FERMENTS Interim Progress Report, 30 Nov. 1980 - 30 Apr. 1981
James F. Ross 30 Apr. 1981 32 p refs
(Contract DE-FG02-81AF-92003)
(DOE/AF-92003/1; IPR-1) Avail: NTIS HC A03/MF A01

Progress is reported in the direct extraction of ethanol by lead free gasoline from mash obtained by fermenting corn. It is found that a significant volume of nonvolatile material, protein or carbohydrate in nature, is extracted along with the ethanol. By distilling the aqueous part of the mash prior to extraction, no nonvolatile material is extracted and the resulting fuel is suitable for use in an internal combustion engine. Energy requirements with the modification are not changed. Higher temperature extractions appear to offer process advantages over lower temperature extractions. Laboratory continuous countercurrent extractions are required to obtain engineering data needed for scale-up to pilot plant scale. DOE

N81-30299# Engineering Societies Commission on Energy, Inc., Washington, D. C.
SYNETHETIC FUELS SUMMARY
Mar. 1981 64 p refs
(Contract DE-AC01-77ET-10679)
(DOE/ET-10679/T10; FE-2468-82-A) Avail: NTIS HC A04/MF A01

The Federal government's experience in synfuels, the market potential of synfuels, the US energy resources base, and the numerous technologies available are examined. Technologies and energy resources are reviewed and compared to provide the facts needed to understand existing energy-related problems. An overview of synfuel technologies and markets is given. DOE

N81-30300# Institute of Gas Technology, Chicago, Ill.
UPGRADING HIGH-NITROGEN NATURAL GAS BY SELECTIVE MEMBRANE PERMEATION
C. D. Landahl and D. L. Klass 1981 11 p refs Presented at the 90th AICHE National Meeting, Houston, Tex., 5-9 Apr. 1981 Sponsored in part by InterNorth, Inc., Omaha
(CONF-810417-7) Avail: NTIS HC A02/MF A01

The technical feasibility of membrane separation was examined for high nitrogen natural gas. An extensive screening of commercial and developmental membranes revealed only a few that are selective for nitrogen. Polyacrylonitrile (PAN) exhibited the highest nitrogen methane separation factors of the membranes tested. However, the permeation rates for PAN are too low for

a practical separation system. Evaluation of membranes of PAN with vinyl and other polymers indicated that permeation rates could be increased while still maintaining separation efficiency of PAN in bilayer membranes. The experimental methods and results of this work and the potential value of the composite PAN membrane system are discussed. DOE

N81-30301# Los Alamos Scientific Lab., N. Mex.
DETONATION PRESSURES OF PBX-9404, COMPOSITION B, PBX 9502, AND NITROMETHANE
W. C. Davis and J. B. Ramsay 1981 9 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1067; CONF-810602-25) Avail: NTIS HC A02/MF A01

Measurements of detonation pressure for PBX-9404, Composition B, PBX-9502, and nitromethane are presented. The interpretations of the data are discussed, and the implications are compared with results from other experiments. The pressures are considered from the point of view of their use as calibrations for calculations, and suggestions are given for slight changes from the measured value for use with limited calculation procedures. DOE

N81-30302# Argonne National Lab., Ill.
CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF HIGH-BTU COAL GASIFICATION. THE HYGAS PROCESS, 1
V. C. Stamoudis, S. Bourne, D. A. Haugen, M. J. Peak, C. A. Reilly, J. R. Stetter, and K. Wilzbach 1980 39 p refs Presented at the 20th Hanford Life Sci. Symp. Coal Conversion and the Environment: Chem., Biomed., and Ecol. Considerations, Richland, Wash., 19-23 Oct. 1980
(Contract W-7405-eng-38)
(CONF-801039-12) Avail: NTIS HC A03/MF A01

The relationships between mutagenic activity and chemical composition for fractions prepared from process stream materials obtained from a high-Btu coal gasification pilot plant in which the HYGAS process is employed were examined. Fractionation procedures included fractional distillation; extraction of acidic, basic, and neutral components; liquid/liquid partitioning; and column chromatography on silica gel. A large number of organic compounds in the fractions have been identified by fused silica, capillary column gas chromatography, and gas chromatography/mass spectrometry (GC/MS). Some fractions contain components that are mutagenic as indicated by the Ames salmonella/microsome mutagenicity assay. Fractionation and GC/MS analysis indicate that the mutagenic components are relatively nonvolatile and that they may include neutral polycyclic aromatic hydrocarbons (PAHs) as well as more polar components such as primary aromatic amines, azaarenes, and hydroxy-PAHs. It is tentatively concluded that the health and environmental risks due to commercialization of the HYGAS would be relatively low. DOE

N81-30303# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
UPGRADING OF COAL-HYDROCARBONIZATION LIQUIDS
Hubert G. Davis, John Potter, and Lou Batta Mar. 1981 20 p refs Presented at the Conf. on Coal Pyrolysis, Palo Alto, Calif., 25-26 Feb. 1981; sponsored by Electric Power Research Inst.
(Contract W-7405-eng-48)
(LBL-12463; CONF-810252-1) Avail: NTIS HC A02/MF A01

In the mid-sixties, Union Carbide seriously considered building a 5000 ton/day plant to hydrocarbonize Wyoming subbituminous coal. The objective was the production of phenol and cresylic acids, with fuel byproducts. The work on upgrading the crude products is discussed briefly in the light of the earlier interest in chemical products and the current interest in synfuels. The original attraction of the process as applied to low rank coal was the substantial yield of phenols. Today it might be the volatile nature of the liquid product. This offers the possibility of converting a high proportion of the crude product to gasoline. DOE

N81-30304# Mound Lab., Miamisburg, Ohio.
INSTRUMENTATION FOR REAL-TIME DATA ANALYSIS AND CONTROL OF SYNTHETIC-FUEL TECHNOLOGIES
R. E. Zielinski, M. K. Agarwal, and P. W. Seabaugh 1981 15 p refs Presented at the Symp. on Instrumentation and Control for Fossil Energy Processes, San Francisco, 8 Jun. 1981
(Contract DE-AC04-76DP-00053)
(MLM-2838(OP); CONF-810607-5) Avail: NTIS HC A02/MF A01

Instrumentation and a sample handling system designed for real-time analysis and control of Underground Coal Gasification Field Test in a 900 foot deep, seven foot thick coal seam worked well in capturing all the data to accurately analyze the process and adequately identify necessary process changes. This instrumentation can be modified for application to other coal conversion processes and can also be modified to ensure automatic control for process optimization. DOE

N81-30305# California Univ., Livermore. Lawrence Livermore Lab.
POSTDETONATION BEHAVIOR OF CONDENSED HIGH EXPLOSIVES BY MODERN METHODS OF STATISTICAL MECHANICS
Francis H. Ree May 1981 11 p refs Presented at the 7th Symp. (Intern.) on Detonation, Annapolis, 15-19 Jun. 1981
(Contract W-7405-eng-48)
(UCRL-85034; CONF-810602-27) Avail: NTIS HC A02/MF A01

An a priori theory of statistical mechanics together with the one fluid van der Waals mixture model was used to compute postdetonation properties of liquid NO, RX-23-AB, and hexanitrobenzene (HNB). The results show satisfactory agreement with the experimental Chapman-Jouguet (C-J) data and the C-J expansion adiabat deduced from the cylinder test data. By comparing the results with experimental data and with results obtained from the Jacobs-Cowperthwaite-Zwisler 3 equation of state and the Becker-Kistiakowsky-Wilson equation of state, it is demonstrated that the a priori theory is superior to the two semi-empirical models. The adiabatic gamma, -(delta 1nP/delta 1nV)/ sub s/, predicted from the a priori theory decreases uniformly with the volume expansion. Analysis of the shock wave data of liquid CO indicates that carbon atoms condense into a diamondlike structure rather than a graphitelike structure, as is assumed by current postdetonation models. DOE

N81-30306# Ames Lab., Iowa.
CORN COB GASIFICATION AND DIESEL ELECTRIC GENERATION
J. J. OToole, T. E. Wessels, B. C. English (Iowa State Univ., Ames), and R. J. Blobaum (Blobaum (Roger) and Associates, Des Moines) 1981 10 p refs Presented at the 8th Energy Technol. Conf., Washingon, D.C., 9-11 Mar. 1981
(Contract W-7405-eng-82)
(IS-M-323; CONF-810315-12a) Avail: NTIS HC A02/MF A01

A program designed to evaluate the collection and transportation costs of corn cobs for the fueling of downdraft gasifiers in the production of low Btu gas is described. The major use of this gas is to fuel diesel/electric generating systems in the many municipalities which can be retrofitted for this purpose. DOE

N81-30307# Argonne National Lab., Ill. Chemical Engineering Div.
STUDY OF INSTRUMENTATION NEEDS FOR PROCESS CONTROL AND SAFETY IN COAL FLUIDIZED-BED COMBUSTION SYSTEMS
C. L. Herzenberg, K. E. Griggs (Fluor Power Services, Chicago), R. F. Henry, and W. F. Podolski Feb. 1981 183 p refs
(Contract W-31-109-eng-38)
(ANL/CEN/FE-80-15) Avail: NTIS HC A09/MF A01

A study was conducted to evaluate the current state of the art of instrumentation for planned and operating fluidized bed combustion systems. This study is intended to identify instrumentation needs and serve as a data base for projects to develop this instrumentation. A considerable number of needs for measurements for which presently available instrumentation is not suitable were reported by respondents. The identified deficiencies are presented with the associated physical parameter ranges for FBC processes. Techniques and instrumentation under development, as well as some available alternative instruments, are discussed briefly. Mechanisms for technical information exchange on

instrumentation for fossil energy applications are identified. Development of instruments to meet the identified measurement deficiencies is recommended in order to ensure the feasibility of automatic control of large scale fluidized bed combustion systems and to advance the state of the art of fluidized bed combustion technology. DOE

N81-30308# California Univ., Livermore. Lawrence Livermore Lab.
MODELING TWO-DIMENSIONAL SHOCK INITIATION AND DETONATION-WAVE PHENOMENA IN PBX 9404 AND LX-17
C. M. Tarver and J. O. Hallquist 15 May 1981 12 p refs Presented at 7th Intern. Symp. on Detonation, Annapolis, 16-19 Jun. 1981 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-84990; CONF-810602-29) Avail: NTIS HC A02/MF A01

The ignition and growth concept of reactive flow in heterogeneous solid explosives is incorporated into a two dimensional, finite element, Lagrangian code and used to model shock initiation and detonation wave propagation experiments on PBX 9404 and LX-17. The failure radii and corner turning abilities of detonating PBX 9404 and LX-17 are calculated. Two dimensional shock initiation experiments on LX-17 which produce both failing and diverging detonation waves are accurately simulated. DOE

N81-30309# California Univ., Livermore.
MODELING STUDIES OF THE PERFORMANCE CHARACTERISTICS OF COMPOSITE EXPLOSIVES
C. Westmoreland and E. L. Lee May 1981 7 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-48)
(UCRL-85001; CONF-810602-26) Avail: NTIS HC A02/MF A01

A model for the initiation and detonation of composite explosives is proposed which considers both monopropellant and fuel oxidizer reactions. This reactive model was incorporated into and Eulerian hydrocode and used to simulate experimental results on composite explosives. The model accounts for variations in compositions without the need to readjust rate parameters for each mixture studied. A limited comparison shows that the calculated failure diameter as a function of composition is in reasonable agreement with experimental results. Calculations of idealized, representative systems indicate that a two mode detonation behavior is unlikely, since the components interact strongly through the pressure dependent deflagration rate law. The calculations also show that either large transport coefficients or very small particle sizes are required to extract the energy of fuel oxidizer mixtures in time to contribute effectively to explosive performance. DOE

N81-30310# Argonne National Lab., Ill.
COAL-BASED INDUSTRIAL-FUELS ASSESSMENT
R. S. Bennett, H. J. Takach, W. H. Seward, R. S. Opalanko, and K. E. Wilzbach 1980 16 p refs Presented at the Ann. Meeting of the Air Pollution Control Assoc., Montreal, 22-27 Jun. 1980
(Contract W-31-109-eng-38)
(CONF-800608-6) Avail: NTIS HC A02/MF A01

The results of a study to identify the economic, environmental, and energy impacts of possible new source performance standards (NSPS) are presented for industrial steam generators on potential use of coal and coal derived fuels in such steam generators. In addition, the same impacts for distillate and residual fuel oils were identified for comparative purposes. This assessment will allow for substantive input to assist in responding to the NSPS that will be proposed by EPA. This program utilized a system level approach where the industrial boiler and its fuel supply were considered from the standpoint of a potential industrial user. DOE

N81-30311# Cornell Univ., Ithaca, N. Y. Dept. of Agricultural Economics.
ETHANOL PRODUCTION IN SOUTHWESTERN NEW YORK: TECHNICAL AND ECONOMIC FEASIBILITY Final Report
Robert J. Kalter Jan. 1981 313 p refs Sponsored by New York State Energy Research and Development Authority
(PB81-188914; NYSERDA-81-3) Avail: NTIS HC A14/MF A01 CSCL 21D

The development of one or more centralized ethanol conversion facilities in the southwestern portion of New York State is discussed. Likely to be commercially feasible if either locally produced cheese whey and/or imported corn are used as a feedstock, development is shown to be highly profitable under a broad range of economic conditions and technical considerations. Four plant designs ranging in annual production capacity from 1.675 to 27.5 million gallons of ethanol (utilizing alternative feedstocks) are investigated. Maximum profitability per unit production are obtained from a 2.5 million gallon plant using only whey. GRA

N81-30312# Institute of Gas Technology, Chicago, Ill.
PILOT PLANT FOR CONVERSION OF BIOMASS TO SNG BY BIOLOGICAL GASIFICATION OF BIOMASS-WASTE BLEND Annual Report
Sambhunath Ghosh, Michael P. Henry, Alvin Iverson, Donald L. Klass, and David P. Chynoweth Jan. 1981 83 p refs Sponsored by Gas Research Inst.
(PB81-201873; GRI-79/0058) Avail: NTIS HC A05/MF A01 CSCL 21D

Research on the chemical characterization and advanced anaerobic digestion of a 32:32:33:3 blend weight percent of volatile solids of water hyacinth, Bermuda grass, municipal solid waste, and sewage sludge from the Gulf Coast continued. Three advanced digestion systems featuring feed pretreatment with a mild alkaline solution, two-phase digestion, the aerobic postreatment of digester residue, and the recycling of the alkali were investigated in an attempt to enhance the gas yield and production rate. Whereas feed pretreatment caused only a modest increase in methane yield during mesophilic digestion, it substantially improved the methane yield and production rate during thermophilic digestion. Performance was improved even more when the spent alkaline solution used for the fresh feed pretreatment was recycled. The best gas production rate was observed when the alkali was recycled at a high loading rate and a low retention time producing a methane yield of 3.5 SCF/lb VS added. GRA

N81-30313# Oak Ridge National Lab., Tenn.
A MATRIX APPROACH TO BIOLOGICAL INVESTIGATION OF SYNTHETIC FUELS
David L. Coffin Mar. 1981 79 p refs Conf. held at Research Triangle Park, N.C., 26 Apr. 1979; sponsored by EPA and DOE
(PB81-183477; EPA-600/9-81-009) Avail: NTIS HC A05/MF A01 CSCL 06T

Documentation is provided for a conference on toxicological assessment of health effects from the rapidly developing synthetic fuels industry. The discussions focus on the Paraho crude shale oil produced and refined into diesel and jet fuels. Summaries of both operations are presented. Also discussed is the collection, storage, and distribution to toxicologists of sample materials from these operations. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N81-30314# Oak Ridge National Lab., Tenn.
RETURN ON YOUR METRICATION INVESTMENT: A CASE STUDY
L. M. Cuddy 1981 29 p Presented at the 7th Ann. Conf. on Productivity Opportunities of Metrication, Washington, D.C., 13 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810449-1) Avail: NTIS HC A03/MF A01

The metrication process used by Union Carbide Corporation Nuclear Division (UCCND) is discussed. Each conversion opportunity is evaluated on its own merits. Observations include: metrication investments should be evaluated using an economic model; valuable rsources that make up the inputs must be quantified and assessed against the possible returns; all metrication investments will result in negative and positive cash flow; timely and well planned conversions are required to assure

financial success; choose only those metrication opportunities that exceed your company's hurdle rate for similar risk category investments. DOE

N81-30315# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
RECOMMENDED PRACTICES FOR THE USE OF POLYMER CONCRETE
J. J. Fontana 1981 23 p Presented at the Extension Symp. on Deterioration and Restoration of Concrete, Madison, Wis., 11-12 May 1981
(BNL-29351; CONF-810532-1) Avail: NTIS HC A02/MF A01

An introduction to polymer concretes is given. Instructions for using polymer concrete patching materials and overlays are presented along with information on precast polymer concrete. DOE

N81-30316# Los Alamos Scientific Lab., N. Mex.
MAGNETIC REFRIGERATION FOR SPACECRAFT SYSTEMS
J. A. Barclay 1981 9 p refs Presented at the 11th Inter-Soc. Conf. on Environ. Systems, San Francisco, 13-15 Jul. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1084; CONF-810715-1) Avail: NTIS HC A02/MF A01

Magnetic refrigerators, i.e., those that use the magnetocaloric effect of a magnetic working material in a thermodynamic cycle, offer potentially reliable, and efficient refrigeration over a variety of temperature ranges and cooling powers. A descriptive analysis of magnetic refrigeration systems is performed with particular emphasis on more efficient infrared detector cooling. Three types of magnetic refrigerator designs are introduced to illustrate some of the possibilities. DOE

N81-30317# Sandia Labs., Albuquerque, N. Mex. Special Projects Div.
NEW APPROACH FOR ASSURING ACCEPTABLE LEVELS OF PROTECTION FROM OCCUPATIONAL SAFETY AND HEALTH HAZARDS
C. A. Jr. Trauth and Jay B. Sorenson (New Mexico Univ., Albuquerque) 1981 31 p refs Presented at the Southwest Labor Studies Conf., Albuquerque, N. Mex., 1 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1131C; CONF-810555-1) Avail: NTIS HC A03/MF A01

The approach to environmental, safety and health program management is briefly described. Its relevance to the conflict over approaches to the national management of occupational safety and health that exists today is discussed. DOE

N81-30318# Purdue Univ., Lafayette, Ind.
SEASONAL PERFORMANCE OF AIR CONDITIONERS: AN ANALYSIS OF THE DOE TEST PROCEDURES: THE THERMOSTAT AND MEASUREMENT ERRORS
Glenn D. Lamb and David R. Tree Jan. 1981 194 p refs
(Contract DE-AC02-80CS-23337)
(DOE/CS-23337/2; Rept-2) Avail: NTIS HC A09/MF A01

The assumption that the major factor in controlling the cycle rate of air conditioners is examined by studying a closed-loop feedback model consisting of a thermostat, a heating/cooling plant and a conditioned space. Important parameters of this model are individually studied to determine their influence on the system. It is found that the switch differential and the anticipator gain are the major parameters in controlling the cycle rate. Errors due to thermocouple response, thermocouple grid placement, dampers and nonuniform velocity and temperature distributions were also considered. Problems in these four areas are mathematically modeled and the basic assumptions are stated. It is found that major disagreement in measured capacity can arise in the these four areas and can be mainly attributed to test set-up differences even though such differences are allowable in the test procedures. DOE

N81-30319# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
AIR INFILTRATION IN BUILDINGS Ph.D. Thesis
Max Howard Sherman Oct. 1980 125 p refs
(Contract W-7405-eng-48)
(LBL-10712) Avail: NTIS HC A06/MF A01

A physical model of infiltration in buildings that can be used to predict the infiltration for a wide range of construction types and climate regions is presented. The problems associated with commonly used tracer gas methods for measuring infiltration were examined in detail so that results obtained from the model could be properly compared with actual measurements. In addition, a simple model of the hydrodynamics of typical leaks in the building envelope was devised in order to study the physical processes of infiltration (i.e., the flow of air through cracks in the structure of the building). Finally, a method for quantifying the leakage of the building envelope (the quantity analogous to envelope thermal conductance) was developed. The name given to this measurement technique is AC pressurization. Although other methods exist for measuring the leakage of a building envelope, AC pressurization is far more accurate and can be used at lower pressures than any existing methods. The model, based on the determination of the effective leakage area, was used to predict the infiltration at 15 separate sites. DOE

N81-30320# Idaho Univ., Moscow. Dept. of Civil Engineering.
SEISMIC BEHAVIOR OF PRECAST CURTAIN WALLS IN HIGH-RISE BUILDINGS Final Project Report
Ronald L. Sack, Richard J. Beers, Jr., Dennis J. Rains, Vincent A. Sessa, David L. Thomas, and Edward A. Wicher Jan. 1981 352 p refs
(Grant NSF PFR-77-20884)
(PB81-193039; NSF/CEE-81003) Avail: NTIS HC A16/MF A01 CSCL 13M

The nature of curtain wall participation in the structural response characteristics of high rise buildings subjected to seismic excitation was investigated. Four basic insert types, plus various combinations of types of connector bodies, were tested to obtain static stiffness properties and low cycle fatigue data. Full scale tests were run on a one-story, single bay structure. The assemblies (consisting of a steel rigid frame with AISC Type 1 connections and two precast concrete panels attached with dissociated connections at the top and integrative connections at the bottom) was subjected to several earthquakes using a closed loop servocontrolled hydraulic loading system. Exceedance levels, power spectra density, and time response plots were obtained for approximately twelve transducers. These studies were augmented with a finite element representation of the assemblage to study the static and dynamic response. GRA

N81-30321# Weidlinger Associates, Menlo Park, Calif.
RESPONSE SURFACE METHOD IN GEOTECHNICAL/STRUCTURAL ANALYSIS, PHASE 1 Final Report
Felix S. Wong Feb. 1981 142 p refs
(Grant NSF PFR-80-09770)
(PB81-192759; R-8104; NSF/CEE-81004) Avail: NTIS HC A07/MF A01 CSCL 08M

In the response surface approach, an approximatng function is fit to a long running computer code based on a limited number of code calculations. The approximating function, called the response surface, is then used to replace the code in subsequent repetitive computations required in a statistical analysis. The procedure of the response surface development and feasibility of the method are shown using a sample problem in slop stability which is based on data from centrifuge experiments of model soil slopes and involves five random soil parameters. It is shown that a response surface can be constructed based on as few as four code calculations and that the response surface is computationally extremely efficient compared to the code calculation. Potential applications of this research include probabilistic analysis of dynamic, complex, nonlinear soil/structure systems such as slope stability, liquefaction, and nuclear reactor safety. GRA

N81-30322# Spangle (William) and Associates, Portola Valley, Calif.
LAND USE PLANNING AFTER EARTHQUAKES
George G. Mader, William E. Spangle, Martha L. Blair, Richard L. Meehan (Earth Sciences Associates), Sally W. Bilodeau (Earth Sciences Associates), Henry J. Degenkolb (Degenkolb (H. J.) and Associates), George S. Duggar (Degenkolb (H. J.) and Associates), and Norman Williams, Jr. (Degenkolb (H. J.) and

Associates) 1980 185 p refs
(PB81-185936; NSF/RA-800303) Avail: NTIS HC A09/MF A01 CSCL 13B

Factors in post-earthquake land use planning which can effectively reduce further earthquake risk in urban areas were analyzed. A wide variety of responses to earthquake hazards was observed, ranging from a cavalier disregard for future risk, to a long term concerted effort to improve seismic safety. Effectiveness of land use planning in post-earthquake reconstruction is influenced by four major factors: (1) cause and extent of damage; (2) hazard and risk evaluation; (3) capabilities of local government to respond to an earthquake; and (4) role of the Federal government in post-earthquake decisions. GRA

N81-30323# SRI International Corp., Menlo Park, Calif.
MACHINE INTELLIGENCE RESEARCH APPLIED TO INDUSTRIAL AUTOMATION Technical Report, 1 Aug. 1979 - 31 Aug. 180
D. Nitzan, S. Barnard, R. Bolles, R. Cain, W. Park, and R. Smith Nov. 1980 197 p refs
(Grant NSF DAR-78-27128; SRI Proj. 3487)
(PB81-180085; NSF/RA-800426; Rept-1) Avail: NTIS HC A09/MF A01 CSCL 13H

Exploratory research into advanced automation is described. The main objectives are: (1) to explore and develop general purpose, cost-effective techniques and hardware/software modules for computer controlled systems of manipulators, sensors, and other components that are flexible, adaptable, and easily trained to perform material handling, inspection, and assembly tasks; and (2) to transfer this technology to industry. Five principal topics are treated: recognition and location of partially visible objects; inspection using planar light; inspection using gray scale; dimensional measurements from quantized images; and a modular programmable assembly system. GRA

N81-30324# Bureau of Mines, Albany, Oreg. Mineral Resources Technology.
CLADDING METALS BY CONTINUOUS STRIP ROLLING IN VACUUM
Robert Blickensderfer 1980 16 p refs
(PB81-181653; BM-RI-8495) Avail: NTIS HC A02/MF A01 CSCL 13H

Equipment and procedure for the continuous roll bonding of metal strips are described. The reels, mill rolls, and furnace were located within a vacuum chamber capable of operation at a residual gas pressure of 0.0001 to 0.00001 torr. Several metals were successfully clad at rolling temperatures of 930 to 1,050 C in lengths up to 120 ft. The bimetals that were clad included stainless steel to carbon steel, molybdenum, and nickel to stainless steel and carbon steel, and titanium to carbon steel. Bend tests of bond integrity are described, and microstructures of the interfaces are presented. The amounts of brittle intermetallic phases formed at the interface are minimized by this cladding method. GRA

N81-31088*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSS 14 64-METER ANTENNA. COMPUTED RF PATH-LENGTH CHANGES UNDER GRAVITY LOADINGS
M. S. Katow *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 123-131 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 13B

N81-31102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPUTERIZED ENERGY ANALYSIS FOR THE MARS OPERATIONS SUPPORT BUILDING
C. S. Yung *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 247-257 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 13B

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N81-30325*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
RADAR ALTIMETER WAVEFORM MODELED PARAMETER RECOVERY
Aug. 1981 59 p refs
(NASA-TM-73294) Avail: NTIS HC A04/MF A01 CSCL 17I

Satellite-borne radar altimeters include waveform sampling gates providing point samples of the transmitted radar pulse after its scattering from the ocean's surface. Averages of the waveform sampler data can be fitted by varying parameters in a model mean return waveform. The theoretical waveform model used is described as well as a general iterative nonlinear least squares procedures used to obtain estimates of parameters characterizing the modeled waveform for SEASAT-1 data. The six waveform parameters recovered by the fitting procedure are: (1) amplitude; (2) time origin, or track point; (3) ocean surface rms roughness; (4) noise baseline; (5) ocean surface skewness; and (6) altitude or off-nadir angle. Additional practical processing considerations are addressed and FORTRAN source listing for subroutines used in the waveform fitting are included. While the description is for the Seasat-1 altimeter waveform data analysis, the work can easily be generalized and extended to other radar altimeter systems. A.R.H.

N81-30326*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EXPERIMENTAL STUDY OF THE CONCATENATED REED-SOLOMON/VITERBI CHANNEL CODING SYSTEM PERFORMANCE AND ITS IMPACT ON SPACE COMMUNICATIONS
K. Y. Liu and J. J. Lee 15 Aug. 1981 43 p refs
(Contract NAS7-100)
(NASA-CR-164698; JPL-Pub-81-58) Avail: NTIS HC A03/MF A01 CSCL 17B

The need for efficient space communication at very low bit error probabilities to the specification and implementation of a concatenated coding system using an interleaved Reed-Solomon code as the outer code and a Viterbi-decoded convolutional code as the inner code. Experimental results of this channel coding system are presented under an emulated S-band uplink and X-band downlink two-way space communication channel, where both uplink and downlink have strong carrier power. This work was performed under the NASA End-to-End Data Systems program at JPL. Test results verify that at a bit error probability of 10 to the -6 power or less, this concatenated coding system does provide a coding gain of 2.5 dB or more over the Viterbi-decoded convolutional-only coding system. These tests also show that a desirable interleaving depth for the Reed-Solomon outer code is 8 or more. The impact of this 'virtually' error-free space communication link on the transmission of images is discussed and examples of simulation results are given. A.R.H.

N81-30327*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SCATTERING OF PRUPPACHER-PITTER RAINDROPS AT 30 GHz
C. Yeh (California Univ., Los Angeles), R. Woo, A. Ishimaru (Washington Univ.), and J. W. Armstrong 1 Aug. 1981 27 p refs
(Contract NAS7-100)
(NASA-CR-164699; JPL-Pub-81-63) Avail: NTIS HC A03/MF A01 CSCL 20N

Optimum design of modern ground-satellite communication systems requires the knowledge of rain-induced differential attenuation, differential phase shift, and cross polarization factors. Different available analytical techniques for raindrop scattering problems were assessed. These include: (1) geometrical theory of diffraction; (2) method of moment; (3) perturbation method; (4) point matching methods; (5) extended boundary condition

method; and (6) global-local finite element method. The advantages and disadvantages of each are listed. The extended boundary condition method, which was determined to yield the most scattering results, is summarized. The scattered fields for Pruppacher-Pitter raindrops with sizes ranging from 0.5 mm to 3.5 mm at 20 C and at 30 GHz for several incidence angles are tabulated. A.R.H.

N81-30328*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MICROWAVE NOISE TEMPERATURE AND ATTENUATION OF CLOUDS AT FREQUENCIES BELOW 50 GHz

Stephen D. Slobin 1 Jul. 1981 115 p refs

(Contract NAS7-100)

(NASA-CR-164702; JPL-Pub-81-46) Avail: NTIS HC A06/MF A01 CSCL 20N

The microwave attenuation and noise temperature effects of clouds can result in serious degradation of telecommunications link performance, especially for low-noise systems presently used in deep-space communications. Although cloud effects are generally less than rain effects, the frequent presence of clouds will cause some amount of link degradation a large portion of the time. Cloud types, water particle densities, radiative transfer, attenuation and noise temperature calculations are reviewed and examples of basic link signal to noise ratio calculations are given. Calculations for twelve different cloud models are presented for frequencies of from 1 to 50 GHz and elevation angles of 30 degrees and 90 degrees. These case results may be used as a handbook to predict noise temperature and attenuation values for known or forecast cloud conditions. A.R.H.

N81-30329# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE USE OF FAST FOURIER TRANSFORM ALGORITHMS TO SPEED THE CALCULATION OF PARABOLIC ANTENNA RADIATION PATTERNS [ULTIZACAO DO ALGORITMO DE TRANSFORMADA RAPIDA DE FOURIER (FFT) NA ACELERACAO DO CALCULO DE DIAGRAMAS DE IRRADIACAO DE ANTENAS PARABOLICAS]

Jose Mazzucco, Jr. May 1981 95 p refs In PORTUGUESE; ENGLISH summary

(INPE-2071-TDL/053) Avail: NTIS HC A05/MF A01

A system for reflector antenna simulation, with digital computer was developed. A reduction was achieved in the line for the calculation of the antenna's radiation pattern, through the use of the fast Fourier transform algorithm, associated with the numerical solution of an oscillating double integral, which is part of the mathematical model used in the simulation. Author

N81-30330# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

TELEPHONE SYSTEM FOR TRANSMISSION OF METEOROLOGICAL SATELLITE IMAGES [SISTEMA DE TRANSMISSAO DE IMAGENS DE SATELLITES METEOROLOGICOS FOR VIA TELEFONICA]

Juan Carlos Pinto deGarrido and Luiz Geraldo Rocha deCarvalho Dec. 1980 24 p refs In PORTUGUESE; ENGLISH summary

(INPE-1960-RPE/274) Copyright. Avail: NTIS HC A02/MF A01

A compression system for high resolution meteorological images is described which is based on the adaptive and hybrid DELTA/DPCM codification technique. The system uses the delta mode (one bit for each pixel) to code the regions of smooth changes, which prevail in these kind of images and the DPCM mode (three bits for each pixel) for regions of more sharp changes. The codification is accomplished in software in the HP 2116B computer and has the purpose to obtain a substantial data compression, to allow the transmission by telephone line in a useful time. In the receiving terminal, a decoder allows the reconstruction of the image without appreciable loss of quality. R.C.T.

N81-30331# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

TRANSVERSE VOICE RADIO LINK FOR STRATOSPHERIC BALLOONS [RADIOENLACE DE VOZ ATRAVES DE BALAO ESTRATOSFERICOS]

Etiene Monteiro Schneider Jan. 1981 14 p refs In PORTUGUESE; ENGLISH summary Presented at the 23nd Ann. Meeting of SBPC

(INPE-1992-RPE/285) Copyright. Avail: NTIS HC A02/MF A01

A three-way communication system between a scientific balloon, aircraft, and ground tracking station is described. The balloon payload, which flies at an altitude of 40 km, is used as an active repeater. The system uses links already existing in this kind of flight: telecommand, telemetry, and radio localization. The signal from the ground station comes to the balloon through the telecommand link, is sent to the aircraft through the radio localization link. The signal from the aircraft comes to the balloon through the telecommand link and is sent to the ground station through the telemetry link. Aircraft and ground station use a normal VHF communication link. J.D.H.

N81-30332# Army Armament Research and Development Command, Dover, N. J.

MEDIUM FILTER NOISE IMPROVEMENT OF DIGITAL IMAGERY Final Report

Gary Sivak Jun. 1981 65 p refs

(DA Proj. 121-61101-A0-11A)

(AD-A101303; AD-E400635; ARSCD-TR-81007) Avail: NTIS HC A04/MF A01 CSCL 17/5

Designs for fire control automatic target recognition systems require poise-free or low-noise digital imagery of visible and infrared targets. Median filter noise cleaning of digital imagery was investigated to determine the extent to which different size median filter windows will improve the signal-to-noise ratio of a digital image with the least deterioration or degradation to the shape or position of the edges of a target. Examples of median filtering and adaptive window filtering (AWMF) are presented before and after noise cleaning, and an improvement over AWMF is proposed to remedy its display deficiencies. Recommendations are offered on how to proceed to obtain more meaningful results and how to extend the simulation to two dimensions before performing test on actual digital imagery data. GRA

N81-30333# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

SPACE CHARGE WAVES IN A CYLINDRICAL WAVEGUIDE WITH ARBITRARY WALL IMPEDANCE Final Report

Han S. Ohm 20 Feb. 1981 58 p refs

(AD-A101190; NSWC/TR-81-65) Avail: NTIS HC A04/MF A01 CSCL 20/14

Properties of the space charge waves in a solid relativistic electron beam propagating in a cylindrical waveguide is investigated, including the important influence of arbitrary wall impedance. The stability analysis is carried out within the framework of the linearized Vlasov-Maxwell equations. In order to examine the influence of the axial momentum spread on the stability behavior, it is assumed that all electrons have a Lorentzian distribution in the axial canonical momentum. One of the most important features of the analysis is that, for short axial wavelength perturbations, the eigenfunction can be described by a Bessel function. Moreover, the condition for zero phase velocity of the space charge wave is also obtained, in connection with collective ion acceleration. Space charge wave properties for a dielectric loaded waveguide are also investigated. For appropriate choice of dielectric constant epsilon and thickness of the dielectric material, it is shown that a strong mode coupling occurs, exhibiting the growth rate of instability comparable to the beam plasma frequency. The physical mechanism of instability is the Cherenkov radiation. Author (GRA)

N81-30334# Laser Diode Labs., Inc., New Brunswick, N.J.

LIGHT EMITTING DIODES FOR FIBER OPTIC COMMUNICATIONS Final Report, 30 Sep. 1976 - 28 Feb. 1981

Albert Gennaro 31 Mar. 1981 158 p

(Contract DAAB07-76-C-8135)

(AD-A101480; CORADCOM-76-8135-F) Avail. NTIS HC A08/MF A01 CSCL 09/1

The design and fabrication of high speed etched-well emitting diodes for fiber optic communications is discussed with regard to material synthesis via LPE, wafer fabrication, and device assembly in a manufacturing environment. Author (GRA)

N81-30335# Harris Corp., Melbourne, Fla.
CODING FOR NAVY UHF SATELLITE COMMUNICATIONS. CODEC EVALUATION STUDY
14 May 1981 21 p
(Contract N00014-75-C-1146)
(AD-A101664; JA-1688) Avail: NTIS HC A02/MF A01 CSCL 22/2

The NAVELEX breadboard codec performance has been verified in the uncoded and coded modes at all code rates. The operation of the data interleaver/deinterleaver and differential encoder/decoder has also been substantiated in the performance tests. Both the 1-bit hard decision and the 3-bit soft decision decoder modes are operational. Initial difficulties in the checkout phase were determined to originate in a defective -5 volt power supply module, which is being replaced. It was also necessary to perform some minor adjustments to the AGC gain block D.C. bias control (R8). Through careful adjustment of this bias control, an acceptable signal output to the quantizer-bit synchronizer was obtained. This nulling adjustment allows for optimum coder-decoder performance in the presence of zero-mean noise, by eliminating the D.C. offset present at the quantizer input. GRA

N81-30336# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A DISTRIBUTED SHORTEST PATH PROTOCOL
Francine B. M. Zerbib and Adrian Segall Jun. 1981 32 p refs
(Contracts N00014-75-C-1183; N00014-77-C-0532; NR Proj. 049-383)
(AD-A101685; LIDS-P-1102) Avail: NTIS HC A03/MF A01 CSCL 12/1

We present a distributed protocol for obtaining the shortest paths between all pairs of nodes in a network with weighted links. The protocol is based on an extension of the Dijkstra (centralized) shortest path algorithm and uses collaboration between neighboring nodes to transfer the information needed at the nodes for the successive construction of the shortest paths. A formal description of the protocol is given by indicating the exact algorithm performed by each node. The validation proofs are greatly simplified by separating the communication mechanism from the computation at the nodes, the latter being the transposition of the Dijkstra shortest path algorithm to the decentralized protocol. Author (GRA)

N81-30337# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
TWO INTERFERING QUEUES IN PACKET-RADIO NETWORKS
M. Sidi (Technion, Haifa, Israel) and A. Segall (Technion, Haifa, Israel) Jun. 1981 35 p refs Submitted for publication
(Contract N00014-75-C-1183; NR Proj. 049-383)
(AD-A101633; LIDS-P-1101) Avail: NTIS HC A03/MF A01 CSCL 17/2

We consider several classes of interfering queues that appear in packet-radio networks. We analyze the class of systems where one of the queues is given full priority and obtain an expression for the joint probability distribution of the queue lengths. For ALOHA-type systems with two symmetric queues, we calculate the average packet waiting time and queue lengths and for symmetric systems with an arbitrary number of subscribers we develop a method to approximate these quantities. The approximation turns out to be close to the analysis and simulation results. Author (GRA)

N81-30338# AMAF Industries, Columbia, Md.
IMPACT OF LOW ALTITUDE COVERAGE REQUIREMENTS ON AIR-GROUND COMMUNICATIONS Final Report, Aug 1980 - Mar. 1981
B. Magenheim Washington FAA 31 Mar. 1981 93 p
(Contract DOT-FA78WAI-830)
(AD-A101642; FAA-RD-81-9) Avail: NTIS HC A05/MF A01 CSCL 17/2

A representative area of Appalachia surrounding Charleston, West Virginia is analyzed in terms of existing helicopter traffic patterns and communications facilities. Traffic patterns were established from telephone interviews with pilots flying this area regularly. Communications coverage was established from computer generated coverage contours obtained from the Electromagnetic Compatibility Analysis Center (ECAC) and verified by pilot interviews and one flight test (as reported by the FAA Technical Center). Techniques for improving coverage are discussed. These include two new remote communication outlets located in the mountains west and south of Beckley, W. Va., a high gain antenna at Charleston pointed in a southerly direction, the use of mobile radio telephone to permit pilots to access nearby telephone facilities when on the ground at a remote site, short range less than 150 miles, hf radio, and a discrete frequency for exclusive use by low-flying aircraft. FAA activities directed at improving communications to helicopter flying to and from offshore oil and gas platforms in the Gulf of Mexico is presented in an Appendix. Author (GRA)

N81-30339# Princeton Univ., N. J.
EDGE-DENSITY-PROFILE EFFECTS FOR LOW-HYBRID-WAVEGUIDE COUPLING
J. Stevens, M. Ono, R. Horton, and J. R. Wilson Apr. 1981 22 p refs
(Contract DE-AM02-76CH-03073)
(PPPL-1779) Avail: NTIS HC A02/MF A01

The usual predictions of linear coupling theory for lower hybrid waves are altered by including an overdense edge plasma in the plasma model. Coupling is found to depend strongly on the value of the edge density, as well as the density gradient. The regimes, where one or the other of these parameters is important, are investigated. Typically, only the first few millimeters of the edge plasma is important in determining coupling. The major implications of the problem of coupling to an overdense plasma can be derived from a simple impedence matching argument. DOE

N81-30340# Westinghouse Electric Corp., Raleigh, N.C
FIELD DEMONSTRATIONS OF COMMUNICATION SYSTEMS FOR DISTRIBUTION AUTOMATION, VOLUME 4 Final Report, period ending Dec. 1980
Jun. 1981 392 p refs Sponsored in part by Electric Power Research Inst. Prepared in cooperation with Long Island Lighting Co., Hicksville, N.Y.
(Contract DE-AC65-80WP-15223; EPRI Proj. 850-40; EPRI Proj. 850-41)
(EPRI-EL-1860-Vol-4) Avail: NTIS HC A17/MF A01

A field demonstration was conducted for the use of UHF radio links in the 950 MHz portion of the spectrum as a communication medium for performing automated electric power distribution. Prototype radio hardware was combined with logic and control equipment developed by Westinghouse for power line carrier automated distribution systems. Transceivers were used in the remote interactive terminals. Three dbm transceivers were used in the central base station and the three primary radio terminals, which functioned as system repeaters. Pre-installation field strength measurements were made along selected radials and in spot locations to characterize the anticipated field strength contours that would be encountered during the operational testing. A propagation model was developed that accurately predicted the conditions actually recorded. Post-installation measurements were used to further calibrate the computer model. The resulting propagation analysis proved exceedingly effective in characterizing a UHF radio system for digital communication. DOE

N81-30341# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
STIMULATED RAMAN SCATTERING AND FOUR-WAVE MIXING: STEADY-STATE PLANE-WAVE ANALYTIC SOLUTIONS
Jay R. Ackerhalt 1981 8 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1228; CONF-810429-22) Avail: NTIS HC A02/MF A01

The equations for plane wave steady state propagation of n fields interacting via four wave processes in a Raman medium are examined. Complete analytic solutions are illustrated for the process of harmonic generation. Solutions are obtained in the gain regime assuming zero pump depletion. Assuming all fields satisfy the phase matching condition, general analytic solutions to these equations are shown. The solutions are complete in

that they describe both pump depletion and saturation. Some example problems are presented. DOE

N81-30342# Universite Catholique de Louvain (Belgium). Lab. de Telecommunications et d'Hyperfrequences.

STUDY OF THE INFLUENCE OF THE ATMOSPHERE ON THE PERFORMANCE OF AN IMAGING MICROWAVE RADIOMETER

A. Guissard Paris ESA Jul. 1980 248 p refs
(Contract ESTEC-4124/79/NL-DG(SC))
(ESA-CR(P)-1421) Avail: NTIS HC A11/MF A01

Errors induced by the intervening atmosphere on the determination of ground parameters from a set of radiometers operating in two polarization states and in the frequency range from 5 to 90 GHz were analyzed. The precision with which the atmospheric parameters themselves are measurable was studied. Methods for estimating parameters from measurements performed in a noisy environment are discussed. The radiative transfer problem through a scattering medium is reviewed and an approximate scalar form of the radiative equation proposed, valid under the assumption that the depolarizing effect can be neglected. A complete model for the atmosphere is discussed, and analytical expressions for the attenuations from atmospheric gases, clouds and rain are given for the frequency range of interest. Models for the radiative behavior of sea and sea ice are discussed. Finally the performance of the multichannel radiometer is analyzed for several typical situations. Author (ESA)

N81-30343# Kiruna Geophysical Inst. (Sweden).

CHATANIKA INCOHERENT SCATTER RADAR MEASUREMENTS: A THREE DAY EXPERIMENT

J. Murdin and A. Brekke (Tromsoe Univ., Norway) Oct. 1980 67 p refs Sponsored by DNA and NSF
(KGI-80-1; ISSN-0347-6405) Avail: NTIS HC A04/MF A01

Radar was operated in a three position mode with a short/long pulse sequence for power profile and autocorrelation function (ACF) measurements. The ionospheric parameters which can be derived from such a basic data set are reviewed. Electron density and plasma temperature measurements are described and electric fields, currents, neutral winds, Joule and particle heating derived. Measurements are presented in a geophysical context. An empirical relationship between ionospheric heating and magnetic disturbances observed on the ground is derived. A method is presented for interpreting long monopulse measurements made in the E-region in order to determine ion-neutral collision frequencies. Problems associated with ion composition are investigated and the relationship between Joule heating and ion temperature described. Author (ESA)

N81-30344# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.

DATA COMMUNICATION NETWORK MONITORING FOR FAILURE DIAGNOSIS IN THE PRESENCE OF NON-DIGITAL LINKS

Louis-Francois Pau 1980 22 p refs
(Contract CNRS-A-6513738)
(ENST-D-80006) Avail: NTIS HC A02/MF A01

The measurement, monitoring, and diagnostic capabilities implemented in distributed, imbedded, or separate hardware test and monitoring units (TMU'S), which use the network itself or other transmission links to communicate, are considered. Features acquired by TMU's are at three levels, analog signals, digital signals, and data traffic. They must also be preprocessed for error compensation at the signal and data levels, followed by control and reconfiguration orders generated locally and eventually transmitted to other nodes. Node instrumentation and compromises, and failure detection probabilities and data integrity are discussed. Author (ESA)

N81-30345# Societe Nationale Industrielle Aerospatiale, Paris (France).

PROSPECTS OF SATELLITE TV BROADCAST

Francois J. Turck and Francois Caneparo 1980 11 p Presented at 31st Intern. Astron. Fed. Congr., Tokyo, 21-28 Sep. 1980 Submitted for publication
(SNIAS-802-422-102; IAF-80-D-196) Avail: NTIS HC A02/MF A01

The wide diversity in technical choices and performance characteristics in existing and planned systems is surveyed. Besides the frequencies chosen and area covered, the main differences are due to the service definition. A comparison shows that two distinct forms of direct tv broadcast mission will develop. One (mainly for the European market) is direct-to-home broadcasting with high power density on the ground. The Franco-German program of tv-broadcasting is described. The other corresponds to lower flux for community reception, with more expensive ground stations. The size of the space craft is not only determined by these factors but also by coverage and the number of transponders; and a solution is achieved by balancing space and Earth segment performances, time scale, and costs. Author (ESA)

N81-30346# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.

A TYPOLOGY OF THE MODEL AS USED IN SIGNAL PROCESSING

Claude Gueguen Sep. 1980 6 p Presented at l'Aquila Workshop on Signal Processing, 9-11 Sep. 1980
(ENST-C-80011) Avail: NTIS HC A02/MF A01

Modeling as the fundamental operation in systems theory, where a mathematical description of the transformation of inputs into outputs is inferred from incompletely measured data, is described. Modeling procedures, i.e., characterization of model structure, parameter finding, and validation of the hypothesized model are summarized. Representation models and knowledge oriented models in signal processing are contrasted and the need for more dialog between proponents of these two systems emphasized. Author (ESA)

N81-30347# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

ISSUES IN THE DESIGN OF A KEY DISTRIBUTION CENTRE

W. L. Price and D. W. Davies Apr. 1981 24 p refs
(NPL-DNACS-43/81; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

Problems associated with the secure distribution of cryptographic keys within a communication environment are discussed. The role and functioning of a key distribution center is considered, both in the context of single key cryptosystems (Data Encryption Standard) and in that of public key cryptosystems. Reference is made to the design criteria which arise from a requirement for digital signatures and to the particular constraints which are imposed when users within the domains or different key distribution centers wish to communicate securely. Author (ESA)

N81-30348# Fondazione Ugo Bordoni, Rome (Italy).

VOICE TRANSMISSION PROBLEMS IN PACKET SWITCHING NETWORKS [PROBLEMI RELATIVI ALLA TRASMISSIONE DELLA VOCE NELLE RETI A COMMUTAZIONE DI PACCHETTO]

Lucio Prina-Ricotti Dec. 1980 15 p refs In ITALIAN
(FUB-35-1980) Avail: NTIS HC A02/MF A01

The technologies available for voice transmission in packet switching networks are assessed and the development objectives are indicated. The most frequently used technique is pulse code modulation but it is inappropriate for applications with limited channel resources. Other algorithms yield a quality proportionate to their complexity, the implementing cost and the coding rate. A comparison of the relative complexity of various coding systems is presented referred to the comparatively simple adaptive delta modulator. (A channel vocoder for instance is 100 times more complex). The problem of packet loss and its influence on voice intelligibility is analyzed, showing that for 16 kbit/sec voice coding and 1 kbit packet length, the loss of about one packet per 100 may result in poor quality transmission. It is concluded that reseach should be oriented towards the 9.6 kbit/sec limit with very high quality coding with the necessary adaptive characteristics. Author (ESA)

N81-30349# Ricerche e Progetti s.r.l., Turin (Italy).

PERFORMANCE ANALYSIS OF UPLINKS FOR REGENERATIVE SATELLITE REPEATERS Final Report

M. Pent, M. Elia, L. LoPresti, and V. Castellani Paris ESA Jan. 1981 239 p refs
(Contract ESTEC-3977/79/NL-DG(SG))

(ESA-CR(P) 1429) Avail: NTIS HC A11/MF A01

The conceptual design of satellite communications considering on-board regenerative repeaters was studied. Uplink (complete transmission chain) using differentially coherent phase shift keying operating in a time division multiple acess burst mode environment was considered. The effects of imperfect block components as well as the intefering signals effects on the system performances were analyzed. A design procedure and some general criteria are exposed in order to speed up the design of these transmission systems. The impairing effects of the disturbing factors are considered with respect to an ideal reference system in both transient and steady state working conditions. The symbol error probability as a function of signal to noise ratio is the measure of performance. The considered impairing factors are: (1) impaired transmitting and receiving filters; (2) imperfect modulators and demodulators; (3) imperfect clock recovery. The simulation results, obtained using the TOPSIM facilities, are summarized.

Author (ESA)

N81-30350# Research Inst. of National Defence, Stockholm (Sweden).

STUDIES OF TARGET SIGNATURES WITH A COHERENT LASER RADAR

G. Bolander, K. Gullberg, I. Renhorn, O. Steinvall, and A. Widen May 1981 54 p refs

(FOA-C-30220-E1) Avail: NTIS HC A04/MF A01

Measurements of target signatures performed with a CO2 laboratory laser radar of a homodyne doppler type are described. Receiver sensitivity and dependence on aperture and target signatures are discussed, as well as imaging and ranging out to 2 km. The measurements of target signatures refer to signal amplitude spectra, noise and root mean square signals. The detection probabilities at various false alarm rates were calculated based upon these parameters. Sandblasted aluminum plates were typical speckle targets and a corner cube was used to simulate glint targets. Military vehicles were used as well as objects of interest for obstacle avoiding such as wires and framework. Comparison with theoretical results for speckle and glint targets made.

Author (ESA)

N81-30351# Institute for Telecommunication Sciences, Boulder, Colo.

WAVE INTERACTION OBSERVATIONS OF IONOSPHERIC MODIFICATION IN THE D-REGION

C. J. Chilton Mar. 1981 41 p refs

(PB81-194276; NTIA-Rept-81-66) Avail: NTIS HC A03/MF A01 CSCL 04A

Radio wave interaction measurements using the high power transmitter at Platteville resulted in cross modulation of up to 30 percent as compared to the earlier cross modulation measurements of 7 percent or less at low power. A theory is derived which shows that for a high power heating transmitter, the cross modulation is proportional to the square of the electron temperature. Additional measurements and theory are given which indicate that large radiated powers will produce fairly large electron density increases in the D-region, depending upon heating transmitter frequency and wave polarization. The heating of the ionospheric D region apparently produces changes in the reflection process at low frequencies. Experimental data taken during solar flares, which support this conclusion, are presented. GRA

N81-31075*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROJECT ORION MICROWAVE SUBSYSTEM DESIGN

D. L. Gannon *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 10-17 (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

N81-31076*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NARROW CHANNEL BANDWIDTH RECEIVER FOR VLBI

E. N. Sosa, T. Sato, and D. A. Tyner *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 18-29 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 17B

N81-31079*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DSN COMMAND SYSTEM

H. C. Thorman *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 53-60 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 17B

N81-31080*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE DSN VLBI SYSTEM MARK 4-85

W. D. Chaney *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 61-76 ref (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

N81-31087*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

BORESIGHTING TECHNIQUES FOR THE ANTENNA CONTROL ASSEMBLY (ACA)

K. P. Abichandani and J. E. Ohison (Stanford Telecommunications, Inc.) *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug 1981 p 116-122 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

N81-31092*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ANTENNA BEAM SOLID ANGLE RELATIONSHIPS

T. Y. Otoshi *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 168-172 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

N81-31095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

BURST STATISTICS OF VITERBI DECODING

L. J. Deutsch and R. L. Miller *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 187-193 refs (For primary document see N81-31072 21 99)

Avail: NTIS HC A12/MF A01 CSCL 17B

N81-31096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EFFICIENT TECHNIQUE FOR THE PERFORMANCE EVALUATION OF ANTENNA ARRAYS WITH NOISY CARRIER REFERENCE

T. Y. Yan and L. Clare *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 194-206 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N81-30352 Rice Univ., Houston, Tex.

THE PHOTOTRON Ph.D. Thesis

Sedgwick Lewis Simons, Jr. 1981 107 p

Avail: Univ. Microfilms Order No. 8116995

A potentially more efficient mode of operation in which the electron period of motion is approximately half of the radio frequency (RF) period is considered. Computer plots of the electron trajectories reveal that unlike the multi-pass mode, this mode exhibits a genuine electron bunching process. Since these modes operate at low bias voltages an investigation of space charge effects and electron emisson energy was made. Theoretical results from a computer program based on an analysis by Guernsey and Fu show that potentials within the phototron can be dramatically reshaped by space charge, altering electron motion

in the phototron and filtering show electrons out of the beam. Experimental measurements of the electron energy spectra document this filtering effect. Efficiency calculations show that the greatest restriction on overall efficiency is due to the photocathode itself. The test model tubes show a cathode efficiency of only about 1%, but better materials may improve this value to about 10%. If the efficiency of the conversion of dc to RF in the phototron can also be improved, an overall device efficiency of 1% for the conversion of sunlight into RF may be realized in the near future. Dissert. Abstr.

N81-30353 Stanford Univ., Calif.
SELF-CONSISTENT PERTURBATION THEORY FOR NOISE IN CROSSED-FIELD DIODES Ph.D. Thesis
Stephen Edgar Rosenthal 1981 125 p
Avail: Univ. Microfilms Order No. 8115826

Four universal diode functions are obtained for space charge limited planar diodes. A cross field diode is completely specified by three external parameters: its width normalized by the electronic Debye length at the cathode, anode voltage normalized by the cathode temperature in volts, and magnetic field normalized by the Brillouin field at the cathode. Evaluating the universal functions at abscissas appropriate for a given set of the three external parameters then allows the calculation of the anode noise power for those parameters. The results of our analysis show that the noise level of a space charge limited diode increases monotonically from the reduced level at zero mgnetic field. Dissert. Abstr.

N81-30354*# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
STUDY PROGRAM FOR DESIGN IMPROVEMENTS OF THE X-3060 KLYSTRON. PHASE 3: ELECTRON GUN FABRICATION AND BEAM ANALYZER EVALUATION. PHASE 4: KLYSTRON PROTOTYPE FABRICATION AND TESTING Final Report
Art Goldfinger May 1981 63 p Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-955593)
(NASA-CR-164672; JPL-9950571) Avail: NTIS HC A04/MF A01 CSCL 09C

A full scale model was produced to verify suggested design changes. Through beam analyzer study, the correct electron beam diameter and cross sectional profile were established in conjunction with the desired confining magnetic field. Comparative data on the performance of the X-3060 klystron, design predictions for the improved klystron, and performance data taken during acceptance testing of the prototype VKS-8274 JPL are presented. T.M.

N81-30355*# Microelectronics Engineering Corp., Auburn, Ala.
RAD HARD PROM DESIGN STUDY Interim Report
Jul. 1981 28 p refs
(JPL-9950579)
(NASA-CR-164774; IR-3; MEC-81-076-R) Avail: NTIS HC A03/MF A01 CSCL 09C

The results of a preliminary study on the design of a radiation hardened fusible link programmable read-only memory (PROM) are presented. Various fuse technologies and the effects of radiation on MOS integrated circuits are surveyed. A set of design rules allowing the fabrication of a radiation hardened PROM using a Si-gate CMOS process is defined. A preliminary cell layout was completed and the programming concept defined. A block diagram is used to describe the circuit components required for a 4 K design. A design goal data sheet giving target values for the ac, dc, and radiation parameters of the circuit is presented. J.D.H.

N81-30356*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOTAL-DOSE RADIATION EFFECTS DATA FOR SEMICONDUCTOR DEVICES, VOLUME 1
William E. Price, Keith E. Martin, Donald K. Nichols, Michael K. Gauthier, and S. Frederick Brown 1 Aug. 1981 193 p refs (Contract NAS7-100)
(NASA-CR-164707; JPL-Pub-81-66-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09C

Steady-state, total-dose radiation test data are provided in graphic format, for use by electronic designers and other personnel using semiconductor devices in a radiation environment. Data are presented by JPL for various NASA space programs on diodes, bipolar transistors, field effect transistors, silicon-controlled rectifiers, and optical devices. A vendor identification code list is included along with semiconductor device electrical parameter symbols and abbreviations. A.R.H.

N81-30357# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RESONANCE FREQUENCY AND TUNING BANDS OF CYLINDRICAL DIELECTRIC RESONATORS [FREQUENCIA DE RESSONANCIA E FAIXA DE SINTONIA DE RESSOADORES DIELECTRICOS CILINDRICOS]
Carlos Eduardo Santana Apr. 1981 38 p refs In PORTUGUESE; ENGLISH summary
(INPE-2042-NTE/169) Avail: NTIS HC A03/MF A01

A method is described for determinating the resonance frequency of TE modes of a cylindrical dielectric resonator placed on the top of a dielectric substrate and with fine tuning by means of the adjustable distance from the flat cylinder face to a metallic plate. Curves of the resonance frequency variation as a function of the physical parameters of the resonator are presented. Many of these curves are compared to experimentally measured values, showing an accuracy better than 1.5 percent. Author

N81-30358# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
HIGH FREQUENCY LOW NOISE AMPLIFIER PROJECT [PROJETO DE AMPLIFICADORES DE BAIXO RUIDO EM ALTA FREQUENCIA]
Wilton Jose Fleming Apr. 1981 37 p refs In PORTUGUESE; ENGLISH summary
(INPE-2032-NTE/168) Avail: NTIS HC A03/MF A01

The design of low noise high frequency amplifiers using S parameters for transistors is described. Simple equations are given for the design of the matching circuits and for determining the minimum noise figure parameters. A.R.H.

N81-30359# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BALUN LINE: MICROSTRIP RELEASE [BLUN FAIXA: LARGA EM LINA DE FITA]
Lucio Baptista Trannin Cividanes May 1981 16 p refs In PORTUGUESE; ENGLISH summary Original contains color illustrations
(INPE-2072-NTE/172) Avail: NTIS HC A02/MF A01

The theory and design of a tapered balun transformer which functions over a wide frequency range is presented. The balun is an impedance-match transition from a microstrip line to a balanced line, formed by two strips with equal width, one strip on each side of the dielectric sheet. Measurements on a test balun show a good performance, both in voltage standing wave ratio and in insertion loss. For its inherent ease of construction and good reproducibility, this type of balun can be utilized in a great number of applications, including the construction of balanced mixes and the excitation of antennas. Author

N81-30360*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF COMPUTER-DESIGNED SMALL-SIZED FOUR-STAGE DEPRESSED COLLECTOR FOR OPERATION OF DUAL-MODE TRAVELING WAVE TUBE
Peter Ramins and Thomas A. Fox Aug. 1981 14 p refs
(NASA-TP-1832; E-643) Avail: NTIS HC A02/MF A01 CSCL 09C

A computer-designed axisymmetric 2.4-cm-diameter four-stage depressed collectors was evaluated in conjunction with an octave bandwidth, dual-mode traveling wave tube (TWT). The TWT was operated over a wide range of conditions to simulate different applications. The collector performance was optimized (within the constraint of fixed collector geometry which was designed for operation of the TWT at saturation) over the range of TWT operating conditons covered. For operation of the dual-mode TWT at saturation, average collector efficiencies of 81 1/2 and 82 percent for the high and low modes, respectively, were obtained across an octave bandwidth, leading to a three-fold increase in the TWT overall efficiency. For operation of the TWT

in the linear, low distortion range, collector efficiencies of 87 to 92 percent were obtained, leading to TWT overall efficiencies as high as 35 percent. For operation of the dual-mode TWT over a 10 to 1 range in output power, overall efficiencies of 14 to 41 percent were obtained. Author

N81-30361# Army Engineer Waterways Experiment Station, Vicksburg, Miss

ELECTRICAL NOISE PROBLEMS ASSOCIATED WITH CABLE AND GAGE FAILURE DURING EXPLOSIVE TESTING Final Report

F. P. Hanes, F. P. Leake, and G. P. Bonner Jun. 1981 21 p refs

(AD-A101517; WES-MP-0-81-1) Avail: NTIS HC A02/MF A01 CSCL 17/2

Electrical noise and cross talk generated during explosive testing by gage and cable destruction were investigated. Results indicate that the primary instrumentation parameters affecting noise and cross talk levels are cable type, transducer bridge symmetry and its effects on signal conditioner common mode rejection ratio, and the degree of isolation between conditioner power circuits. Author (GRA)

N81-30362# Harry Diamond Labs., Adelphi, Md.

BIPOLAR TRANSISTOR AND DIODE FAILURE TO ELECTRICAL TRANSIENTS-PREDICTIVE FAILURE MODELING VERSUS EXPERIMENTAL DAMAGE TESTING. 1: JUNCTION CAPACITANCE DAMAGE MODEL

Michael J. Vrabel Jun. 1981 99 p refs

(DA Proj. 1L1-62120-AH-25)

(AD-A101518; HDL-TR-1959) Avail: NTIS HC A05/MF A01 CSCL 09/1

For all the difficulties engendered in its use, semiconductor device damage data are an integral part of many programs of electromagnetic pulse vulnerability assessment and hardening. Experimental damage data, which are generated only as a result of dedicated efforts, can be expected to be available for only a minor fraction of all semiconductor devices. This limited supply has spurred efforts to develop predictive damage models, in order to bypass the tedious experimental requirements for generating damage data. The predictive ability of the best of these models, the junction capacitance damage model, is investigated in detail. Central to this study is a library of experimental damage data for 46 silicon device types, comprising bipolar transistors and diodes tested at the 10-, 1-, and 0.1-micro-sec. pulse durations. These are devices from the front ends of a number of Army systems and represent radio, field wire, and cable functions with operating ranges in the direct current (dc) to microwave region. Of the 46 experimental devices comprising 68 junction types (collector-to-base and emitter-to-base junctions treated as distinct for all transistors), sufficient published manufacturers' data were available for the damage modeling of 11 junctions. These were supplemented with measured parameters for 27 junction types. GRA

N81-30363# Harry Diamond Labs., Adelphi, Md.

BIPOLAR TRANSISTOR AND DIODE FAILURE TO ELECTRICAL TRANSIENTS-PREDICTIVE FAILURE MODELING VERSUS EXPERIMENTAL DAMAGE TESTING. 2: AFWAL TRANSISTOR AND DIODE FAILURE MODEL

Michael J. Vrabel Army Electronics Research and Development Command Jun. 1981 34 p

(DA Proj. 1L1-62120-AH-25)

(AD-A101581; HDL-TM-81-13) Avail: NTIS HC A03/MF A01 CSCL 09/1

An investigation of the predictive capability of a new Air Force Weapons Laboratory model for transistor and diode failure under reverse bias was initiated. A comparison with the junction capacitance damage model shows a doubled improvement at high confidence levels based on an Army-generated population of experimental damage data. Author (GRA)

N81-30364# TRW Defense and Space Systems Group, Redondo Beach, Calif. Electronic Systems Div.

GaAs ANALOG INTEGRATED CIRCUITS FOR MICROWAVE APPLICATIONS Status Report, 1 Apr. - 31 May 1981

29 May 1981 12 p

(Contract N00014-81-C-0042)

(AD-A101663; S/N-37362) Avail: NTIS HC A02/MF A01 CSCL 09/5

The objective of the first phase of the GaAs Analog Integrated Circuits program is to develop several monolithic circuits which can be used as building blocks in a 360 deg continuously variable phase shifter. The circuits are to be designed, fabricated and tested to determine how they will perform in a hybrid and later a completely monolithic phase shifter. The circuits required include microwave analog multipliers at 10 GHz, a quadrature phase splitter and appropriate input and output circuits. GRA

N81-30365# Stanford Linear Accelerator Center, Calif.

HIGH-CURRENT INJECTOR FOR THE PROPOSED SLAC LINEAR COLLIDER

M. B. James and R. H. Miller Mar. 1981 3 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981

(Contract DE-AC03-76SF-00515)

(SLAC-Pub-2701; CONF-810314-149) Avail: NTIS HC A02/MF A01

A new, high-current injector was designed to yield the 7.5 x 10 to the 10th power e(-) per S-band bunch necessary for the proposed linear collider. The injector consists of two prebunchers at the 16th subharmonic, a 0.75 c traveling wave buncher, and a three-meter velocity of light traveling wave structure. The e(-) beam is confined by a solonoidal magnetic field in the buncher and capture regions. A computer simulation similar to that used by Mavrogenes et al., was possible to achieve approximately 1 x 10 to the 11th power e(-) in 16(0) of S-band from a 15 amp gun pulse of 1.5 nsec duration. DOE

N81-30366# Sandia Labs., Albuquerque, N. Mex.

DISCUSSION OF THE ROLE OF DISTRIBUTED EFFECTS IN LATCH-UP

A. Ochoa, Jr. and P. V. Dressendorfer 1981 7 p refs Presented at the IEEE Conf. on Nucl. Sci. and Space Radiation, Seattle, 21 Jul. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-0658C; CONF-810707-1) Avail: NTIS HC A02/MF A01

Certain distributed and parasitic aspects of four layer structures that play significant roles in latch-up are discussed. The distributed effects of contact resistance and spreading resistance and the drive conditions of the coupled transistor pair are shown to be of particular importance in applying the lumped model theory to parasitic latch-up phenomena and in understanding parasitic latch-up. The lumped model will continue to be a useful conceptualization and analysis vehicle but must allow for additional parasitic elements, and coupled shunt paths must be considered. Possible changes in device parameters reflecting the distributed nature of the devices with changes in modes of operation of the latch-up path should be taken into account. DOE

N81-30367# Sandia Labs., Albuquerque, N. Mex.

DIGITALLY CONTROLLED X-RAY MAPPING

W. F. Chambers 1981 5 p refs Presented at the 16th Ann. Conf. of the Microbeam Analysis Soc., Vail, Colo., 13 Jul. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-0331C; CONF-810705-2) Avail: NTIS HC A02/MF A01

For making X-ray maps in electron microprobe analysis, a system is described which calculates and sets instrumental parameters so that trial and error is eliminated and a properly exposed X-ray map is generated every time. The procedure is given for Fe. The system was used to prepare X-ray maps of oxides in a simulated nuclear waste sample; an example is given. DOE

N81-30368# Oregon State Univ., Corvallis. School of Oceanography.

CYCLING OF TRANSURANIC RADIONUCLIDES IN THE COLUMBIA RIVER, ITS ESTUARY AND THE NORTHEAST PACIFIC OCEAN Progress Report, Feb. 1980 - Feb. 1981

T. M. Beasley 1981 25 p refs

(Contracts DE-AT06-76EV-70030; DE-AM06-76RL-02227)

(DOE/EV-70030/4; RLO-2227/T30-4) Avail: NTIS HC A02/MF A01

Progress is reported in research dealing with the behavior

of transuranic and other radionucleotides in the Columbia River. Efforts were made to finalize the analyses of Columbia River cores for transuranic and other radionucleotides, as well as to complete the analyses of offshore cores. Mass spectrometry data for Pu isolated from Columbia River sediments were also acquired. Analyses were also completed of cores from anoxic basins to test the theory of anionic complexone remobilization of transuranic radionucleotides. DOE

N81-30369# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
GROUND-PLANE INSULATION FAILURE IN THE FIRST TPC SUPERCONDUCTING COIL
M. A. Green, P. DelPierre, K. Derby, J. M. DeOlivares, P. H. Eberhard, B. T. Fultz, R. D. Giauque, G. H. Gibson, F. S. Goulding, J. I. Kim et al Mar. 1981 6 p refs Presented at the 7th Intern. Conf. on Magnet Technol., Karlsruhe, West Germany, 30 Mar. - 3 Apr. 1981
(Contract W-7405-eng-48)
(LBL-12326; CONF-810340-9) Avail: NTIS HC A02/MF A01

On August 27, 1980, an insulation failure occurred during the testing of the TPC (Time Projection Chamber) thin superconducting solenoid. The accident caused shorts between the ultra pure aluminum (UPA) secondary circuit and the superconducting coil. There were also shorts between thee UPA circuit and ground. The results of an analysis of experimental data taken at 5 millisecond intervals by a data logger and a PDP-11 computer are presented. The results of X-ray and ultrasonic tests and the results of the coil autopsy are discussed. From the evidence, a most probable cause for the failure is given. DOE

N81-30370# Los Alamos Scientific Lab., N. Mex.
RADIAL-PULSE PROPAGATION AND IMPEDANCE CHARACTERISTICS OF OPTICALLY SHUTTERED CHANNEL INTENSIFIER TUBES
J. L. Detch, Jr. (EG and G, Inc., Santa Barbara, Calif.) and B. W. Noel 1981 14 p refs Presented at the Conf. on Optics, Santa Fe, N Mex., 6 Apr 1981
(Contracts W-7405-eng-36, DE-AC08-76NV-01183)
(LA-UR-81-1220; CONF-810429-14) Avail: NTIS HC A02/MF A01

A distributed transmission line model that describes analytically the voltage and current wave propagation characteristics as functions of time for any point on the surface was developed. The optical gain's spatial uniformity and shutter open times depend on the electrical pulse width and amplitude, and on the applied bias. The driving point impedance is derived from the model and is a function of an infinite sum of terms in the complex frequency. The synthesis in terms of lumped constant network elements is realized in first and second Foster equivalent circuits. DOE

N81-30371# Sandia Labs., Albuquerque, N. Mex.
CUSTOM HIGH-RELIABILITY RADIATION-HARD CMOS-LSI CIRCUIT DESIGN
Wilson J. Barnard 1981 9 p refs Presented at Univ./Govern./Indus. Microelectron. Symp., State College, Miss., 26 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-0449C; CONF-810533-3) Avail: NTIS HC A02/MF A01

A custom CMOS-LSI design capability to provide high reliability radiation hardened circuits depends on (1) proven design practices to enhance reliability; (2) use of well characterized cells and logic modules; (3) computer-aided design tools to reduce design time and errors and to standardize design definition; and (4) close working relationships with the system designer and technology fabrication personnel. Tradeoffs are made during the design between circuit complexity/performance and technology/producibility for high reliability and radiation hardened designs to result. A radiation hardened bulk CMOS technology fabrication line developed and maintained for production of prototype and small production volume parts is described. DOE

N81-30372# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRONICS ENGINEERING RESEARCH Final Report
Camille Minichino, ed. and Stein Weissenberger, ed. Mar. 1981 42 p
(Contract W-7405-eng-48)
(UCID-19023) Avail: NTIS HC A03/MF A01

The Electronics Engineering Research Program (EER), is responsible for developing state-of-the-art electronics capabilities in support of long-term needs of Lawrence Livermore Laboratory, gets its funding from the nuclear explosives program. The EER focuses on anticipating and meeting weapons program objectives. During FY 1980, EER comprised six projects: gallium arsenide circuit development, computer modeling of particles and fields, image processing, signal processing, decision and system analysis, and geophysical applications. The objectives, accomplishments, and future plans of these projects are described. DOE

N81-30373# Los Alamos Scientific Lab., N. Mex.
SUPERCONDUCTING SOLENOID DESIGNED FOR 400 kJ AT 25 kA UNDER CONDITIONS OF FAST DISCHARGE AND FIELD REVERSAL
D. Weldon, P. Chowdhuri, M. Honig, J. D. Rogers, and P. Thullen May 1981 13 p refs
(Contract W-7405-eng-36)
(LA-8829-MS) Avail: NTIS HC A02/MF A01

A 1.26 mH superconducting solenoid made of NbTi and Cu-CuNi mixed matrix superconductor was designed and fabricated. The coil was designed to tore 400 kJ at a current of 25 kA and was operated to currents of 20 kA. Development of high current cables and low loss superconductors are both necessary undertakings for future fusion devices. The first tests of the coil involved a very slow charge of the coil followed by a rapid discharge in 1.07 ms with a capacitor bank and a normal conductor load coil in a resonant L-C-L circuit. The second test consisted of a slow charge followed by a discharge and recharge on a time scale of a few seconds. This latter cycle resembled that expected in a Tokamak induction coil. Loss measurements were made by an electrical method during the second series of tests. DOE

N81-30374# General Electric Co. Pittsfield, Mass.
THREE-PHASE UHV ac TRANSMISSION RESEARCH, 1977-1979
L. E. Zaffanella, M. G. Comber, K. J. Lloyd, and R. J. Nigbor May 1981 361 p refs
(EPRI Proj. 68-4)
(EPRI-EL-1820) Avail: NTIS HC A16/MF A01

A 3-phase ac test line with different bundles and line configurations was energized to obtain design data on audible noise, radio noise, corona loss, and television interference for line voltages between 1000 and 1500 kV. In addition, basic research on audible noise produced by bundle conductors, flashover tests on line insulation with switching impulses, and flashover tests on contaminated insulators under steady state and transient overvoltages were performed. The results obtained are reported in detail and are used as the basis for a revision of line design data. DOE

N81-30375# National Academy of Sciences - National Research Council, Washington, D. C. Panel on Techniques for the Investigation of the Degradation of Electrical Insulation.
EXPERIMENTAL TECHNIQUES FOR INVESTIGATING THE DEGRADATION OF ELECTRICAL INSULATION Final Report
May 1981 144 p refs Sponsored by EPRI
(EPRI-EL-1854; TPS-79-723) Avail: NTIS HC A07/MF A01

The range of changes that occur during the aging and degradation of polyolefin polymers is assessed and existing and emerging experimental techniques evaluated for their ability to detect the sensitive changes and ultimately to predict lifetime characteristics of the materials. DOE

N81-30376# Los Alamos Scientific Lab., N. Mex.
NANOSECOND-GATING PROPERTIES OF PROXIMITY-FOCUSED MICROCHANNEL-PLATE IMAGE INTENSIFIERS
N. S. P. King, G. J. Yates, S. A. Jaramillo, and J. W. Ogle (Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.) 1981 22 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981

(LA-UR-81-1126; CONF-810429-18) Avail: NTIS HC A02/MF A01

Some fundamental properties of 18 mm-diam gated proximity focussed mirochannel plate (MCP) image intensifiers used as fast image shutters in the 1 to 10 ns range were identified and studied. Light pulses from a modelocked dye laser optically sample the gated MCP. Shuttering is achieved by applying a forward biasing electrical gate pulse to the quiescently reverse-biased photocathode MCP interface. Variable delay between the gate pulse and the laser pulse permits tracing the MCP's optical response. Gating speeds, turn-on and turn-off patterns, the asymmetric spatial depedence of the MCP optical response, and resolution effects as functions of gate pulse width and photocathode-MCP bias were characterized. Variations in the intensity profiles of the phosphor's spatial response for uniform photocathode illumination are measured with a calibrated silicon intensified target focus projection, scan television camera and a high speed video digitizer while photomultipliers monitor the laser pulse and the phosphor's spatially integrated output intensities. DOE

N81-30377# California Univ., Livermore. Lawrence Livermore Lab.

SUBNANOSECOND TRIGGER SYSTEM FOR ETA

E. G. Cook, E. J. Lauer, L. L. Reginato, D. Rogers, and D. Schmidt 30 May 1980 16 p refs Presented at 14th Pulse Power Modulator Symp., Orlando, Fla., 3-5 Jun. 1980 Submitted for publication

(Contracts W-7405-eng-43; N60921-80-PO-W0003; ARPA Order 3718)

(UCRL-83992; CONF-800640-20) Avail: NTIS HC A02/MF A01

A high voltage trigger system capable of triggering 30, 250 kV spark gaps; each with less than + or - 1 ns jitter was constructed. In addition to low jitter rates, the trigger system must be capable of delivering the high voltage pulses to the spark gaps either simultaneously or sequentially as determined by other system requirements. The trigger system consists of several stages of pulse amplification culminating in 160 kV pulses having 30 ns risetime. The trigger system is described and test data provided. DOE

N81-30378# Argonne National Lab., Ill.

EFFECTS OF SOLDERING VOID ON RECOVERY CHARACTERISICS OF A CRYOSTABLE SUPERCONDUCTOR

Y. Huang and S.-T. Wang 1980 5 p refs Presented at the Appl. Superconductivity Conf., Santa Fe, N. Mex., 20 Sep. - 30 Oct. 1980 Submitted for publication

(Contract W-31-109-eng-38)

(CONF-800980-40) Avail: NTIS HC A02/MF A01

The effect of the void on the characteristics of hot end recovery and cold and recovery for CFFF superconductors is investigated. Tests were made on samples having different lengths of soldering void under various magnetic field strengths and injecting energies. The recovery current and the temperature distributions along the matrix and the copper stabilizer were determined. Test results are presented. DOE

N81-30379# Eaton Corp., Southfield, Mich.

USE OF ELASTOMERS IN REGENERATIVE BRAKING SYSTEMS

1981 28 p refs Presented at the Rubber Div. Meeting of the Am. Chem. Soc., Minneapolis, 1-5 Jun. 1981

(W-7405-eng-48)

(UCRL-15353; CONF-810648-1) Avail: NTIS HC A03/MF A01

The storage of potential energy as strain energy in elastomers was investigated. The evolution of the preferred stressing scheme is described, and test results on full-size elastomeric energy storage units sized for an automotive regenerative braking system application are presented. The need for elastomeric material improvements is also discussed. DOE

N81-30380# Sandia Labs., Albuquerque, N. Mex.

COMPUTER AIDS FOR INTEGRATED CIRCUIT DESIGN AT SANDIA NATIONAL LABORATORIES

Gerald W. Brown 1981 6 p refs Presented at the 24th Midwest Symp. on Circuits and Systems, Albuquerque, N. Mex., 29 Jun. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-1320C; CONF-810623-3) Avail: NTIS HC A02/MF A01

A general framework for a hierarchical computer-aided design (CAD) system for VLSI design is described. The system supports both functional and physical design in the area of initial design specification, system synthesis, simulation, mask layout, verification, and documentation. The system is being implemented in phases within a user environment on a DECsystem 20-VAX 11/780 computer network. It supports evolutionary changes as new technologies, design strategies, and application programs are developed. DOE

N81-30381# Los Alamos Scientific Lab., N. Mex. Accelerator Technology Div.

HIGH-CURRENT-DENSITY COILS FOR HIGH-RADIATION ENVIRONMENTS

Alexander Harvey 1981 4 p refs Presented at 7th Intern. Conf. on Magnet Technol., Karlsruhe, West Germany, 30 Mar. - 3 Apr. 1981 Revised

(Contract W-7405-eng-36)

(LA-UR-81-973-Rev; CONF-810340-5-Rev) Avail: NTIS HC A02/MF A01

The limits on current density for continuous operation of indirectly cooled mineral-insulated coils are explored by thermal analysis, and the criteria for cable optimization are established. The insulation system, compacted magnesium oxide powder, has the following advantages: (1) radiation insensitivity - no detectable degradation at 10 to the 4th rads, with no reason to expect this to be close to any limite; (2) flexibility - enabling standard coil winding practice to be followed, without the problems of fired ceramics; (3) good thermal conductivity - 2.36 W/m.K at room temperature and (4) high temperature stability - making the metal components of the coil determine the operational temperature limit, rather than the insulation system as in conventional coils. The cooling system avoids oxidation problems caused by radiolysis of water. Other potentially radiation-sensitive components also are discussed. An example is given of the design procedure. The feasibility of extending the technique to commercial fusion reactor coils is examined. DOE

N81-30382# Sandia Labs., Albuquerque, N. Mex.

PARTIAL DISCHARGE TESTING OF BULK TRANSFORMER OIL

G. J. Rohwein 1981 4 p refs Presented at the 3rd IEEE Intern. Pulsed Power Conf., Albuquerque, N. Mex., 1 Jun. 1981

(Contract W-31-109-eng-38)

(SAND-81-0551C; CONF-810659-8) Avail: NTIS HC A02/MF A01

The generation of partial discharges in bulk transformer oil was investigated experimentally to determine the dominant conditions which contribute to their formation and growth under repetitive impulse stresses. The motivation for conducting these experiments arose from a problem with partial discharges and breakdowns occurring in the insulating oil around the high voltage switch in a continuous running 1.5 MV repetitive pulser system. From the experiment it was found tht repetitive stressing caused low level field ionization around the electrodes which led to bubble formation and eventually partial discharges. There were also qualitative indications of charge accumulation in the oil. Photographic records of numerous shot sequences were used to study the phenomena. DOE

N81-30383# Fondazione Ugo Bordoni, Rome (Italy).

THE SIMULATION OF A REGENERATIVE REPEATER TIMING CIRCUIT IN FILTER RESEARCH [LA SIMULAZIONE DEL CIRCUITO DI TEMPORIZZAZIONE DI UN RIPETITORE RIGENERATIVO A SCOPO DI INDAGINE SUL JITTER]

Domenico DeSeta, Renato Lucarelli, and Wolfgango Maggi Aug. 1980 57 p refs In ITALIAN

(FUB-37-1980) Avail: NTIS HC A04/MF A01

A computerized simulation of jitter in a regenerative repeater timing circuit is presented. A theoretical analysis of the mathematical models is included, taking into consideration the various jitter sources for given circuit structures and transmitting situations. The reliability of the method and the computing time required are discussed. The results obtained for several Q

factors are presented and compared with experimental measurements. Several subroutines refering to cipher generation, signal construction, rectifier-oscillator simulation and zero crossing detector simulation are detailed. Author (ESA)

N81-30384# National Bureau of Standards, Washington, D.C. Electron Devices Div.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: TEST PATTERNS NBS-28 AND NBS-28A: RANDOM FAULT INTERCONNECT STEP COVERAGE AND OTHER STRUCTURES
Michael A. Mitchell and Loren W. Linholm Mar. 1981 39 p refs Sponsored in part by Navy and Air Force
(PB81-181901; NBS-SP-400-65; LC-80-600197) Avail: NTIS HC A03/MF A01 CSCL 14B

Microelectronic test structures for detection of random faults in interconnect step coverage are described. Particular attention is given to associated process and physical analysis test structures included in two test patterns, NBS-28 and NBS-28A. Information about the geometry and application of the test structures in these two test patterns is provided. GRA

N81-31077*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPING NEW ARCHITECTURES FOR THE BLOCK 2 VLBI CORRELATOR SYSTEM
J. C. Peterson *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 30-40 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09C

N81-31098*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COHERENT REFERENCE GENERATOR PHASE STABILITY
V. N. Korwar *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 222-231 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N81-30385*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL INVESTIGATION OF TURBULENT CHANNEL FLOW
Parviz Moin (Stanford Univ., Calif.) and John Kim (Stanford Univ., Calif.) Jul. 1981 73 p refs
(NASA-TM-81309; A-8659) Avail: NTIS HC A04/MF A01 CSCL 20D

Fully developed turbulent channel flow was simulated numerically at Reynolds number 13800, based on centerline velocity and channel halt width. The large-scale flow field was obtained by directly integrating the filtered, three dimensional, time dependent, Navier-Stokes equations. The small-scale field motions were simulated through an eddy viscosity model. The calculations were carried out on the ILLIAC IV computer with up to 516,096 grid points. The computed flow field was used to study the statistical properties of the flow as well as its time dependent features. The agreement of the computed mean velocity profile, turbulence statistics, and detailed flow structures with experimental data is good. The resolvable portion of the statistical correlations appearing in the Reynolds stress equations are calculated. Particular attention is given to the examination of the flow structure in the vicinity of the wall. Author

N81-30386*# Systems and Applied Sciences Corp., Hampton, Va.
WEIGHTED-MEAN SCHEME FOR SOLVING INCOMPRESSIBLE VISCOUS FLOW Final Report
Quyen Q. Huynh May 1981 27 p refs
(Contract NAS1-15604)
(NASA-CR-165747; R SAL-05/81-01) Avail: NTIS HC A03/MF A01 CSCL 20D

The problem of how a boundary layer responds to the motion of a convexerl vortex on a porous wall was investigated. The wall velocity is approximately given by Darcy's law. The vorticity-strearn function approach was adopted for solving Navier-Stokes equations of two dimensional incompressible viscous flows. The weighted-mean scheme was used for constructing finite difference approximations of spatial derivatives. Several test problems were solved and numerical results demonstrate clearly the accuracy, stability, and efficiency of the scheme. The weighted mean scheme then can be applied to the vortical flow problem. Author

N81-30387*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
APPLICATION OF STABILITY THEORY OF LAMINAR FLOW CONTROL Final Report, 1 Sep. 1980 - 1 Aug. 1981
Nabil M. El-Hady and G. L. Goglia Sep. 1981 68 p refs
(Grant NsG-1645)
(NASA-CR-164709) Avail: NTIS HC A04/MF A01 CSCL 20D

Four publications resulted from work performed during the report period September 1, 1980 to August 1, 1981. Topics include: a computer program for calculating the linear incompressible or compressible stability characteristics of the laminar boundary layer on swept wings: the growth of Goertler vortices in compressible boundary layers along curved surfaces: the effect of boundary layer growth on the stability of compressible flows: and the effect of compressibility, suction, and cooling on the centrifugal instability of boundary layer flows along curved walls. For individual titles, see N81-30388 through N81-30389.

N81-30388*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
HADY-1, A FORTRAN PROGRAM FOR THE COMPRESSIBLE STABILITY ANALYSIS OF THREE-DIMENSIONAL BOUNDARY LAYERS
Nabil M. El-Hady *In its* Appl. of Stability Theory of Laminar Control Sep. 1981 22 p (For primary document see N81-30387 21-34)
Avail: NTIS HC A04/MF A01 CSCL 20D

A computer program, HADY-1, is described for calculating the linear incompressible or compressible stability characteristics of the laminar boundary layer on swept and tapered wings. The eigenvalue problem and its adjoint arising from the linearized disturbance equations with the appropriate boundary conditions are solved numerically using a combination of the Newton-Raphson iterative scheme and a variable step size integrator based on the Runge-kutta-Fehlburg fifth-order formulas. The integrator is used in conjunction with a modified Gram-Schmidt orthonormalization procedure. E.D.K

N81-30389*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
THE EFFECT OF BOUNDARY LAYER GROWTH ON THE STABILITY OF COMPRESSIBLE FLOWS
Nabil M. El-Hady *In its* Appl. of Stability Theory of Laminar Flow Control Sep. 1981 10 p refs (For primary document see N81-30387 21-34)
Avail: NTIS HC A04/MF A01 CSCL 20D

The method of multiple scales is used to describe a formally correct method based on the nonparallel linear stability theory that examines the two and three dimensional stability of compressible boundary layer flows. The method is applied to the supersonic flat plate boundary layer at Mach number 4.5. The theoretical growth rates are in good agreement with the experimental results of Kendall. The method is also applied to the infinite span swept wing transonic boundary layer with suction to evaluate the effect of the nonparallel flow on the development of crossflow disturbances. Author

N81-30390*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEP BIMOD VARIABLE CONDUCTANCE HEAT PIPES

ACCEPTANCE AND CHARACTERIZATION TESTS
Joseph A. Hemminger Aug. 1981 175 p refs
(NASA-TM-82635; E-857) Avail: NTIS HC A08/MF A01 CSCL 20D

A series of six heat pipes, similar in design to those flown on the Comunications Technology Satellite Hermes, for use in a prototype Solar Electric Propulsion BIMOD thrust module are evaluated. The results of acceptance and characterization tests performed on the heat pipe subassemble are reported. The performance of all the heat pipes met, or exceeded, design specifications. J.D.H.

N81-30391*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTS ON FLOW THROUGH ONE TO FOUR INLETS OF THE ORIFICE AND BORDA TYPE
R. C. Hendricks and T. Trent Stetz 1981 18 p refs Presented at the Cryogenic Eng. Conf./Intern. Cryogenic Mater. Conf., San Diego, Calif., 10-14 Aug. 1981; sponsored by NBS
(NASA-TM-82680; E-963) Avail: NTIS HC A02/MF A01 CSCL 20D

Choked flow rate and pressure profile data were taken on sequential axially aligned inlets of the orifice and Borda type. The configuration consisted of from two to four inlets spaced at two nominal separation distances of 0.7 and 30 diameters. At the nominal 30 diameter spacing, the reduced flow rate follows a simple empirical relation based on the reduced flow rate for a single inlet. At the nominal 0.7 diameter spacing, fluid jetting was prevalent at low temperatures and flow rates were the same as for a single inlet. Author

N81-30392*# Illinois Inst. of Tech., Chicago.
MODIFICATION IN DRAG OF TURBULENT BOUNDARY LAYERS RESULTING FROM MANIPULATION OF LARGE-SCALE STRUCTURES Interim Report
T. C. Corke, Y. Guezennec, and H. M. Nagib Washington NASA Jul. 1981 28 p refs
(Grant NsG-1591)
(NASA-CR-3444) Avail: NTIS HC A03/MF A01 CSCL 20D

The effects of placing a parallel-plate turbulence manipulator in a boundary layer are documented through flow visualization and hot wire measurements. The boundary layer manipulator was designed to manage the large scale structures of turbulence leading to a reduction in surface drag. The differences in the turbulent structure of the boundary layer are summarized to demonstrate differences in various flow properties. The manipulator inhibited the intermittent large scale structure of the turbulent boundary layer for at least 70 boundary layer thicknesses downstream. With the removal of the large scale, the streamwise turbulence intensity levels near the wall were reduced. The downstream distribution of the skin friction was also altered by the introduction of the manipulator. J.D.H.

N81-30393# Pennsylvania State Univ., University Park. Dept. of Architectural Engineering.
SIMPLIFIED METHODOLOGY FOR CALCULATING BUILDING HEATING LOADS M.S. Thesis
Steven Danser Heinz Nov. 1980 77 p refs
(AD-A101725; AFIT-CI-80-59T) Avail: NTIS HC A05/MF A01 CSCL 13/1

A simplified methodology for accurately calculating building heating loads, termed the 'Modified Bin Method' is developed and validated. The method is reliable and accurate and combines the simplicity of hand calculations with the accuracy of computer simulations to provide a substantial improvement over the conventional simple degree day and bin methods and the high cost of sophisticated hourly simulations. The Modified Bin Method uses standard steady-state equations for envelope heat loss and heat gain is developed using multiple regression techniques based upon a statistical analysis of fifty-one computer simulations of test buildings. Example calculations using this method estimate annual building heating loads to within 1.5% of the results of an accurate computer simulation at a small fraction of the time and expense. Author (GRA)

N81-30394# Midwest Research Inst., Golden, Colo. Building Systems Development Branch.
ANALYSIS OF THE PERFORMANCE AND SPACE-CONDITIONING IMPACTS OF DEDICATED HEAT-PUMP WATER HEATERS
L. Morrison and J. Swisher Dec. 1980 15 p refs Presented at 3rd Ann. Systems Simulation Econ. Analysis/Solar Heating and Cooling Operational Results Conf., Reno, Nev., 27 Apr. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(SERI/TP-721-1014; CONF-810405-15) Avail: NTIS HC A02/MF A01

The operation of a newly marketed dedicated heat pump water heater (HPWH) which utilizes an air to water heat pump, costs about $1000 installed, and obtains a coefficient of performance (COP) of about 2.0 in laboratory and field tests, is a space conditioning benefit if an air conditioning load exists and a penalty if a space heating load exists. A simulation was developed to model the thermal performance of a residence with resistance baseboard heat, air conditioning, and either heat pump or resistance water heating. The building characteristics were adapted (Madison, Wisconsin; Washington, DC; and Ft. Worth, Texas) and the system was simulated for a year with typical weather data. For each city, HPWH COPs are calculated monthly and yearly. The water heating and space conditioning energy requirements of HPWH operation are compared with those of resistance water heater operation to determine the relative performance ratio of the HPWH. DOE

N81-30395# Sandia Labs., Albuquerque, N. Mex.
PROJECT PROPA-GATOR: INTERMEDIATE RANGE EXPLOSION AIRBLAST PROPAGATION MEASUREMENTS
J. W. Reed 1980 20 p refs Presented at the 19th Explosives Safety Seminar, Los Angeles, 9 Sep. 1980
(Contract DE-AC04-76DP-00789)
(SAND-81-1880C; CONF-810371-1; CONF-800941-3) Avail: NTIS HC A02/MF A01

Several hundred explosions of flaked TNT, ranging in charge weight from 2.3 kg to 1145 kg were fired at the NASA Kennedy Space Center, Florida. Comprehensive meteorological measurements were made by rawinsonde balloons and on a nearby 150 m tower, including winds, turbulence, temperatures, and humidity. A cruciform array of airblast gages was operated, with gages at 200 m, 500 m, 1 km, 2 km, and 5 km ranges from the explosions. For some events, as many as six microbarographs were operated at distances to 25 km. Airblast results correlated against refractive atmospheric conditions, establishing a functional relationship between overpressure decay with distance and the sound velocity gradient with height. DOE

N81-30396# Los Alamos Scientific Lab., N. Mex.
HEAT AND MASS TRANSFER IN POROUS MEDIA
T. L. Cook, J. J. Travis, F. H. Harlow, T. J. Bartel, and C. E. Tyner (Sandia National Labs.) 1981 9 p Presented at the 14th Oil Shale Symp., Golden, Colo., 22-24 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1261; CONF-810456-3) Avail: NTIS HC A02/MF A01

Field test data on the OOSI MR3 experiments are used as a basis for exhibiting the computational capabilities of the WAFE computer code. The code is a generalized tool for the analysis of heat and mass transfer in multi-dimensional domains of porous geothermal materials. DOE

N81-30397# Los Alamos Scientific Lab., N. Mex.
DETONATION-WAVE INTERACTIONS
Charles L. Mader 1981 10 p refs Presented at the 7th Symp. on Detonation, Annapolis, 19 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-203; CONF-810602-2) Avail: NTIS HC A02/MF A01

The interaction of laterally colliding, diverging, cylindrical detonation waves in PBX-9404 was studied using the radiographic machine PHERMEX and the two dimensional, reactive Lagrangian hydrodynamic code 2DL. The experimentally observed flow could be numerically reproduced using the Forest Fire heterogeneous shock initiation burn model. The interaction of two, three, and five colliding, diverging spherical detonation waves in PBX-9404 was numerically modeled using the three dimensional, reactive Eulerian hydrodynamic code 3DE. The size and magnitude of the high pressure double, triple, quadruple, and quintuple

interactions depends significantly upon the number and relative locations of initiators. The initiation of propagating detonation in the insensitive explosive PBX-9502 by triple shock wave interaction resulting from three initiators was studied using the 3DE code with Forest Fire kinetics. DOE

N81-30398# Sandia Labs., Albuquerque, N. Mex. Fluid and Thermal Sciences Dept.

DEFINITION OF A FACILITY FOR EXPERIMENTAL STUDIES OF TWO-PHASE FLOWS AND HEAT TRANSFER IN POROUS MATERIALS

Daniel C. Reda and Roger R. Eaton 1981 44 p refs Presented at the 16th Thermophys. Conf., Palo Alto, Calif., 23-25 Jun. 1981

(Contract DE-AC04-76DP-00789)

(SAND-80-2634C; CONF-810614-3) Avail: NTIS HC A03/MF A01

A development effort currently underway to create an experimental capability for the study of two phase, steam/water flows through a variety of porous media is described. Equations are derived for the steady, adiabatic, macroscopically-linear two phase flow of a single-component fluid through a porous medium, including energy transfer both by convection and conduction. These equations are then solved to give relative permeabilities for the steam and water phases as functions of known and/or measurable quantities. A viable experimental approach was formulated leading to the definition of facility components and instrumentation requirements, including the application of gamma-beam densitometry for the measurement of liquid-saturation distributions in porous media. Finally, a state of the art computer code was utilized to numerically simulate the proposed experiments, providing an estimate of the facility operating envelope. DOE

N81-30399# Michigan State Univ., East Lansing. Dept. of Mechanical Engineering.

TRANSIENT THERMAL CONTACT OF TWO SEMI-INFINITE BODIES OVER A CIRCULAR AREA

James V. Beck and Ned R. Keltner (Sandia National Lab., Albuquerque) 1981 33 p refs Presented at the 16th Thermophys. Conf., Palo Alto, Calif., 23 Jun. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-0771C; CONF-810614-2) Avail: NTIS HC A03/MF A01

The transient heat conduction problem of the sudden contacting of two semi-infinite bodies is considered. Accurate analytical expressions are given for the average interface temperature for perfect contact. Both early and large times are covered; the early time expression is much more accurate than previously available. In addition the important and previously untreated case of imperfect contact is solved. The solutions are obtained utilizing a new method of solution called the Unsteady Surface Element (USE) Method. It is demonstrated that the method has considerable power for the solution of linear transient heat conduction problems involving contact between similar and dissimilar bodies. DOE

N81-30400# Sandia Labs., Albuquerque, N. Mex.

NUMERICAL SIMULATION OF CRITICAL POINT HEAT TRANSFER

G. Ronald Hadley 1981 13 p refs Presented at 2nd Intern. Conf. on Numerical Methods in Thermal Probl., Venice, 7 Jul. 1981

(Contract DE-AC04-76DP-00789)

(SAND-80-1932C; CONF-810708-2) Avail: NTIS HC A02/MF A01

In the past, most numerical treatments of naturally convective flows through a porous material have made use of the Boussinesq approximation. The latter assumes that density changes are important only as a driving force in Darcy's law, and results in considerable simplification. Near the critical point, however, large density changes in the convecting fluid can accompany small temperature changes, thus demanding a compressible treatment. The time dependent solution of the fully-compressible equations, including Darcy's law, the time dependent continuity equation, and the time dependent energy equation are studied. Solution of the above equations is accomplished with the use of two scalar potentials, a generalized streamfunction, and a generalized velocity potential, both of which obey elliptic equations. DOE

N81-30401# Argonne National Lab., Ill. Components Technology Div.

MATHEMATICAL MODEL, INSTABILITY MECHANISMS, AND STABILITY CRITERIA OF A GROUP OF CIRCULAR CYLINDERS SUBJECTED TO CROSS FLOW

S. S. Chen May 1981 64 p refs

(Contract W-31-109-eng-38)

(ANL-CT-81-22) Avail: NTIS HC A04/MF A01

A mathematical model is presented for a group of circular cylinders subject to crossflow. The fluid-force coefficients in the model are determined from available experimental data. It is found that there are three dynamic instability mechanisms: galloping controlled by fluid damping, flutter controlled by fluidelastic force, and coupled galloping-flutter instability controlled by both fluid damping and fluidelastic force. Closed-form solutions of the critical flow velocity for galloping and flutter are obtained based on constrained modes. Experimental data are found to be in good agreement with the analytical results. DOE

N81-30402# California Univ., Berkeley. Lawrence Berkeley Lab.

DEVELOPMENT OF ELECTRO-OPTICAL INSTRUMENTATION FOR ANNULAR TWO-PHASE FLOW STUDIES

B. Leskovar May 1981 119 p refs Sponsored by EPRI

(EPRI Proj. 1379-1)

(EPRI-NP-1831) Avail: NTIS HC A06/MF A01

Th development of new electro-optical instrumentation for studying the annular dispersed two phase flow regime is described. The system measures the thickness of the water film and droplet size and velocity distributions which would be encountered in such a flow regime. The water film thickness is measured by an improved capacitance method with a short time constant using newly developed sensor electrodes. The electrodes are made flush with the inner wall of a cylindrical tube and do not disturb the flow. In the test equipment, steady, laminar flow of water along the inner wall of the tube is controlled by appropriate valves and a porous jacket while droplets are introduced by means of a special spray nozzle. GRA

N81-30403# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.

PULSATING-FLOW MEASUREMENT WITH AN ORIFICE FLANGE

Lee M. Bossart 1981 7 p ref Presented at the 11th Transducer Workshop, Seattle, 2 Jun. 1981

(Contract DE-AC08-76NV-01183)

(EGG-1183-1797; CONF-810637) Avail: NTIS HC A02/MF A01

A measurement problem encountered during instrumentation of a geothermal air drilling operation on the Baca Ranch in the Jemez Mountains in New Mexico was how to measure the flow of ammonia water solution injected into the air line. The pump that develops the pressure in the ammonia line is not a positive displacement pump, therefore, counting pump strokes does not determine the number of gal/min of ammonia flow. The flow was measured using an orifice flange differential pressure technique but, the range of flow measured, exceeded the 4:1 range ability of an orifice. A computer smoothing of the differential pressure and the line pressure together with a scaling factor, determined by the shape of the raw differential pressure, provided a smoothing of the flow data which was checked against the actual flow over a long time period to determine the volume of solution injected into the system per hour. An instantaneous reading of ammonia flow was thereby determined. It showed small variations in corrosion rate measured in the standpipe that may have been caused by a momentary variation in the flow of ammonia solution. DOE

N81-30404# Air Products and Chemicals, Inc., Allentown, Pa.

GAS/SLURRY FLOW IN COAL-LIQUEFACTION PROCESSES (FLUID DYNAMICS IN 3 PHASE FLOW COLUMNS) Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1980

David H. S. Ying, R. Sivasubramanian, and Edwin N. Givens Dec. 1980 52 p refs

(Contract DE-AC01-79ET-14801)

(DOE/FT-14801/12) Avail: NTIS HC A04/MF A01

The 6000 T/D SHC-I demonstration plant will employ vertical tubular reactors feeding slurry and gas concurrently upward. This reactor is essentially an empty vessel with only a distributor plate located near the inlet. Because the commercial plant represents a considerable scale-up over either Wilsonville or Ft Lewis, this program is addressing the need for additional data on the behavior of three phase systems in large vessels. Parameters are being studied at conditions that relate directly to the projected demonstration plant operating conditions. Air/water/sand three phase flow system in both a 5-inch diameter and a 12-inch diameter column is used in this cold-flow simulation study program. DOE

N81-30405# Los Alamos Scientific Lab., N. Mex.

CERAMIC HEAT EXCHANGERS: MANUFACTURING TECHNIQUES AND PERFORMANCE

Michael A. Merrigan and Donald J. Sandstrom 1981 16 p refs Presented at WESTEC Conf., Boulder, Colo., 23-25 Mar. 1981 Submitted for publication

(LA-UR-81-1643; CONF-810377-1) Avail: NTIS HC A02/MF A01

The objective of the ceramic heat pipe program being conducted at Los Alamos is demonstration of the practical feasibility of this technology for the solution of severe high temperature recuperation functions. Ceramic heat pipe recuperators were theoretically shown to offer distinct advantages over conventional ceramic heat exchangers from the standpoint of efficiency of heat recuperation and economics. The main stumbling block to their widespread utilization is related to the problems of materials for construction and the details of fabrication and assembly. The performance objectives of ceramic heat pipes and some aspects of the materials technology program aimed at solving the problem of economic ceramic heat pipe fabrication are described. DOE

N81-30406# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

SOME FACTORS AFFECTING THE METERING OF SUBCOOLED WATER WITH A CHOKED VENTURI

J. R. Fincke and David R. Collins 1981 14 p refs Presented at the 27th Intern. Instrumentation Symp., Indianapolis, 27 Apr. 1981

(Contract DE-AC08-76ID-01570)

(CONF-810406-4) Avail: NTIS HC A02/MF A01

A series of experiments characterizing the subcooled choking process in a convergent-divergent nozzle with a constant area throat is described. A low pressure flow loop capable of a maximum water flow rate of 5.5 L/s with a pressure head of 300 kPa and the pressure and temperature upstream of the nozzle in the flow loop adjusted between 90 and 300 kPa and 53 and 96 C. The flow rate, upstream pressure and temperature, and the axial wall pressure profiles in the nozzle were measured. Critical mass flow rate data were acquired along five isotherms as a function of stagnation pressure. Factors affecting metering performance are examined. DOE

N81-30407# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.

COMMENTARY ON DIFFERENTIAL-PRESSURE MEASUREMENTS AT HIGH REFERENCE PRESSURES

Richard T. Hasbrouck and Roger P. Noyes 1981 30 p refs Presented at the 11th Transducer Workshop, Seattle, 2 Jun. 1981

(Contract DE-AC08-76NV-01183)

(EGG-1183-1800; CONF-810637-2) Avail: NTIS HC A03/MF A01

Some practical approaches to the difficult problems in calibrating and implementing differential pressure measurements are discussed. The data presented were gathered several years ago in separate investigations. An attempt is made to compare the results of these investigations to the common mode concept as described by Peter K. Stein in his publication, 'The Measurement of Differential Quantities - Problems and Approaches.' Although one of these investigations involved a 10,000 to 20,000 psi reference-pressure gas measured at an ambient temperature and the other a classic delta P flow measurement of cryogenic temperature, the problems encountered were the same. DOE

N81-30408# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

TWO-PHASE VELOCITY AND DENSITY IN FINITE PIPES BY INTRUSIVE AND NONINTRUSIVE INSTRUMENTATION

T. H. Chen, Nenard N. Kondic (Nuclear Regulatory Commission, Washington, D.C.), Paul Kehler (Argonne National Lab.), and Charles W. Solbrig 1981 34 p refs Presented at the 27th Intern. Instrumentation Symp., Indianapolis, 27 Apr. 1981

(Contract DE-AC07-76ID-01570)

(EGG-M-00881) Avail: NTIS HC A03/MF A01

As part of the search for two phase flow measurement standards, an experimental study was conducted to compare several promising two phase instruments capabilities to measure nitrogen-water flow rates, velocities and densities at high pressure. Two phase quantities in large diameter finite length pipes (in the vicinity of bends) were measured by two nonintrusive means, (1) pulsed neutron activation (PNA) and (2) the gamma beam attenuation densitometer, and by three intrusive devices, (1) drag-disc turbine transducer rake (DTT rake), (2) a traversing turbine, and (3) a full flow turbine. Pipes of this large size are used in the loss-of-fluid test (LOFT) experimental reactor. The measured results indicated pronounced finite flow length effects, as well as an agreement between instruments used. The PNA technique showed promise as a standard method for two phase flow measurements. The nonintrusive methods produced accurate density and velocity values indicating that completely nonintrusive techniques can be used to measure mass flow. DOE

N81-30409# California Univ., Livermore. Lawrence Livermore Lab.

SIMULATING INTERACTIONS BETWEEN TURBULENCE AND PARTICLES IN EROSIVE FLOW AND TRANSPORT

Alfred C. Buckingham and Wigbert J. Siekhaus 1981 13 p refs Presented at the 2nd Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Venice, 13-16 Jul. 1981 Submitted for publication

(Contract W-7405-eng-48)

(UCRL-84691; CONF-810702-2) Avail: NTIS HC A02/MF A01

A numerical procedure is described for simulating fluctuating gas motions and resulting forces on gas-borne particulates. Included are some of the particle influences which significantly alter the driving turbulent field. The coupling apparent between dispersed phase particle and continuous phase turbulent flow is introduced with the help of observations from complementary two phase combustion wind tunnel experiments. In the simulations, particle to gas relative velocities and resulting forces on the particles are obtained at incremental time steps for statistically representative particle groups using a random selection method. The fluctuating velocity components are constrained so that their ensemble averages correspond to the predetermined local mean turbulent energy. The influence of gas-borne particles on turbulent transport, combustion kinetics and subsequent wall surface erosion/corrosion is the central issue of this research DOE

N81-30410# California Univ., Livermore. Lawrence Livermore Lab.

ADDITIVE EROSION REDUCTION INFLUENCES IN THE TURBULENT BOUNDARY LAYER

A. C. Buckingham 6 May 1981 18 p refs Presented at the JANNAF Propulsion Meeting, New Orleans, 26-28 May 1981 Submitted for publication

(Contract W-7405-eng-48)

(UCRL-84957; CONF-810549-1) Avail: NTIS HC A02/MF A01

Results of a sequence of flow, heat and mass transfer calculations are presented which theoretically characterize the erosive environment at the wall surface of refractory metal coated and uncoated gun barrels. The theoretical results include analysis of the wall surface temperature, heat flux, and shear stress time histories on thin (10 mil.) Cr, Mo, Nb, and Ta plated steel barrel walls as uncoated steel walls. The calculations combine effects of a number of separate processes which were previously (and purposely) studied individually. These include solid particle additive concentrations, gas wall thermochemical influences, and transient turbulent wall boundary layer flow with multicomponent molecular

diffusion and reactions from interaction of propellant combustion and the eroding surface. The boundary layer model includes particulate additive concentrations as well as propellant combustion products, considered for the present to be in the local thermochemical equilibrium. DOE

N81-30411# Argonne National Lab., Ill.
HEAT TRANSFER FROM INTERNALLY HEATED HEMISPHERICAL POOLS
J. D. Gabor, P. G. Ellison, and J. C. Cassulo 1980 19 p refs Presented at the 19th Natl. Heat Transfer Conf., Orlando, Fla., 27 Jul. 180; sponsored by ASME
(CONF-800723-28) Avail: NTIS HC A02/MF A01

Experiments were conducted on heat transfer from internally heated ZnSO4-H2O pools to the walls of hemispherical containers. This experimental technique provides data for a heat transfer system that has to date been only theoretically treated. Three different sizes of copper hemispherical containers were used: 240, 280, 320 mm in diameter. The pool container served both as a heat transfer surface and as an electrode. The opposing electrode was a copper disk, 50 mm in diameter located at the top of the pool in the center. The top surface of the pool was open to the atmosphere. DOE

N81-30412# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
THE EFFECT OF AXIAL TUBE ELASTICITY ON WATER HAMMER PRESSURE
Andrzej P. Szumowski (Warsaw Technical Univ.) Jul. 1980 24 p refs
(MPIS-10/1980; ISSN-0436-1199) Avail: NTIS HC A02/MF A01

Pressure surge generation due to instantaneous stopping of liquid flows in a finite straight tube was investigated both theoretically and experimentally. As a result of longitudinal deformation and displacement of the tube, waterhammer pressure varies with time and momentarily exceeds the value predicted by Joukowski. An elastic tube with concentrated masses at both ends is considered in the theoretical analysis. Momentum equations are derived for these masses using the appropriate Riemann's formulas for the longitudinal waves in the tube walls and for the waves in the liquid. The solving of these equations leads to the pressure traces at the tube end loaded by waterhammer effects. These traces were compared with experimental ones. Experiments were performed in a tube in which flow was suddenly stopped by means of an initially water-driven piston. This piston stopped suddenly at the tube end. Agreement and discrepencies between theoretical and experimental results are explained and discussed. Author (ESA)

N81-30413# Imperial Coll. of Science and Technology, London (England). Heat Transfer Section.
NUMERICAL MODELING OF CVD FLOW REACTORS
D. B. Spalding Aug. 1979 39 p refs
(HTS/79/6) Avail: NTIS HC A03/MF A01

The transfer of three-dimensional modelling techniques used in other industries to chemical vapor deposition (CVD) technology is described. An attempt was made to predict the rate of deposition of material onto a wafer as a function of position and time, and to determine the composition of the deposited material together/with the temperature distribution throughout the reactor. A knowledge of possible desired or undesired side-effects, e.g., deposits on reactor walls, was also sought. The initially available information included the size and shape of the reactor and its contents (wafer; support; heater element), the flow rate and composition of the vapor supply as well as the heating conditions. Results show that successful numerical modelling requires a carefully written, economic computer code.
Author (ESA)

N81-30414# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
MATHEMATICAL MODELING OF FLUID-MECHANICS, HEAT-TRANSFER AND CHEMICAL-REACTION PROCESSES: A LECTURE COURSE
D. Brian Spalding Jan. 1980 329 p refs
(HTS/80/1) Avail: NTIS HC A15/MF A01

A review of the structure and context of the physics and mathematics of convective flow phenomena is presented. Emphasis is placed on the practical importance of the subject; the numerical solution procedures described are well adapted for incorporation into digital computer codes. The course is essentially introductory. One lecture covers turbulence models and multiphase mixtures. The main features of many solution procedures are indicated, but no particular problems are actually solved. Author (ESA)

N81-30415# Imperial Coll. of Science and Technology, London (England). Heat Transfer Section.
NUMERICAL COMPUTATION OF FLOWS OF TWO PHASES SEPARATED BY A MOVING INTERFACE
D. Brian Spalding Jun. 1980 40 p refs Presented 3rd Intern. Conf. on Physico Chem. Hydrodyn., Madrid, Mar. 1980
(HTS/80/4) Avail: NTIS HC A03/MF A01

The overcoming of computational difficulties due to the extreme steepness of fluid property gradients is described. This steepness leads to transitions from one density to another (often several times greater) taking place over a distance which is small in comparison with that between adjacent nodes of the finite difference grid. The devices employed include stretching the grid so as to make it conform to the distorting interface, tracking the interface using marker particles, and using individual mass conservation equations for the two phases. A bulk continuity equation can be used rather than a mass continuity one. Special attention is given to the advantages and disadvantages of the gas-and-liquid-analyzer method. Examples this method are given (one dimensional test problem; a wave breaking over an obstacle; a collapsing column of liquid; the rise of a bubble; the explosion of a high pressure bubble of vapor released in a liquid; the propagation of a flame through a tube; etc). The suitability of the methods for solving such problems is demonstrated.
Author (ESA)

N81-30416# National Bureau of Standards, Washington, D.C. Thermophysical Properties Div.
EFFECTIVE THERMAL CONDUCTIVITY OF A GLASS FIBERBLANKET STANDARD REFERENCE MANUAL
David R. Smith, Jerome G. Hust, and Lambert J. VanPoolen Feb. 1981 31 p refs
(Contract DE-AI05-78OR-05965)
(PB81-176133; NBSIR-80-1640) Avail: NTIS HC A03/MF A01 CSCL 14B

The results of thermal conductivity measurements at temperatures from 84 to 360 K on a glass fiberblanket insulation are described. The measurements were performed in an atmosphere of dry nitrogen at a pressure near 84 kPa. The results are analyzed and compared to literature data for similar material. GRA

N81-30417# National Bureau of Standards, Washington, D.C. National Engineering Lab.
EFFECTIVE THERMAL CONDUCTIVITY OF A GLASS FIBERBOARD STANDARD REFERENCE MATERIAL
David R. Smith and Jerome G. Hurst Feb. 1981 33 p refs
(Contract DE-AI05-78OR-05965)
(PB81-181240; NBSIR-81-1639) Avail: NTIS HC A03/MF A01 CSCL 14B

Thermal conductivity measurements on NBS SRM 1450 glass fiberboard insulation (1970 lot) at temperatures from 87 K to 340 K are reported. The measurements were performed in an atmosphere of dry nitrogen at a pressure near 84 kPa (1630 mm Hg). The results are analyzed and compared to NBS certification data and to literature data for similar material. An annotated bibliography of literature sources is included. GRA

N81-31097*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF CAPACITIVE HEAT EXCHANGERS, PART 1
D. Schonfeld *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 207-221 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N81-30418*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RADIOMETER FOR ACCURATE (+ OR - 1%) MEASUREMENT OF SOLAR IRRADIANCE EQUAL TO 10,000 SOLAR CONSTANTS

J. M. Kendall, Sr. 1 Jul. 1981 24 p refs

(Contract NAS7-100)

(NASA-CR-164704; JPL-Pub-81-42) Avail: NTIS HC A02/MF A01 CSCL 14B

The 10,000 solar constant radiometer was developed for the accurate (+ or - 1%) measurement of the irradiance produced in the image formed by a parabolic reflector or by a multiple mirror solar installation. This radiometer is water cooled, weighs about 1 kg, and is 5 cm (2 in.) in diameter by 10 cm (4 in.) long. A sting is provided for mounting the radiometer in the solar installation capable of measuring irradiances as high as 20,000 solar constants, the instrument is self calibrating. Its accuracy depends on the accurate determination of the cavity aperture, and absorptivity of the cavity, and accurate electrical measurements. The spectral response is flat over the entire spectrum from far UV to far IR. The radiometer responds to a measurement within 99.7% of the final value within 8 s. During a measurement of the 10,000 solar constant irradiance, the temperature rise of the water is about 20 C. The radiometer has perfect cosine response up to 60 deg off the radiometer axis. A.R.H.

N81-30419*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DESIGN, DEVELOPMENT, AND FIELD DEMONSTRATION OF A REMOTELY DEPLOYABLE WATER QUALITY MONITORING SYSTEM

John W. Wallace, Ray W. Lovelady, and Robert L. Ferguson Jul. 1981 93 p refs Sponsored in part by EPA

(NASA-TM-83152; EPA-600/4-81-061) Avail: NTIS HC A05/MF A01 CSCL 14B

A prototype water quality monitoring system is described which offers almost continuous in situ monitoring. The two-man portable system features: (1) a microprocessor controlled central processing unit which allows preprogrammed sampling schedules and reprogramming in situ; (2) a subsurface unit for multiple depth capability and security from vandalism; (3) an acoustic data link for communications between the subsurface unit and the surface control unit; (4) eight water quality parameter sensors; (5) a nonvolatile magnetic bubble memory which prevents data loss in the event of power interruption; (6) a rechargeable power supply sufficient for 2 weeks of unattended operation, (7) a water sampler which can collect samples for laboratory analysis. (8) data output in direct engineering units on printed tape or through a computer compatible link; (9) internal electronic calibration eliminating external sensor adjustment; and (10) acoustic location and recovery systems. Data obtained in Saginaw Bay, Lake Huron are tabulated. A.R.H.

N81-30420# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

PHOTOACOUSTIC EFFECT: DEVELOPMENT AND APPLICATIONS OF A SPECTROMETER M.S. Thesis - 30 Oct. 1980 [EFEITO FOTOACUSTICO: DESENVOLVIMENTO DE UM ESPECTROMETRO E APLICACOES]

Marcus Antonius Andrade Siqueira Feb. 1981 112 p refs In PORTUGUESE; ENGLISH summary

(INPE-2006-TDL/044) Avail: NTIS HC A06/MF A01

The photoacoustic effect is examined and its use in the investigation of physical phenomena is explored. The construction of a photoacoustic spectrophotometer and its operation in determining the thermal and transport properties of solid materials is highlighted. A.R.H.

N81-30421# Los Alamos Scientific Lab., N. Mex.

CAMAC GAMMA RAY SCANNING SYSTEM

C. E. Moss, John C. Pratt, and Edward R. Shunk 1981 30 p refs Presented at the 5th Symp. on X- and Gamma-Ray Sources and Applications, Ann Arbor, Mich., 10-12 Jun. 1981

(Contract W-7405-eng-36)

(LA-UR-81-1512; CONF-810647-3) Avail: NTIS HC A03/MF A01

A flexible gamma ray scanning system, based on a multichannel analyzer and CAMAC modules, is described. The system is designed for making simultaneous passive and active scans of objects of interest to nuclear safeguards. The scanner has a stepping motor carriage; the detectors, a bismuth germanate scintillator and a high purity germanium detector. A total of sixteen peaks in the two detector produced spectra can be integrated simultaneously, and any scan can be viewed during data acquisition. The system can be easily reconfigured to accommodate up to seven detectors because it is based on CAMAC modules and FORTRAN. The system is designed for field use and is easily transported. Examples of passive and active scans are presented. DOE

N81-30422# California Univ., Livermore. Lawrence Livermore Lab.

ON-BOARD DATA RECORDER FOR HARD-TARGET WEAPONS

W. A. Niven and M. F. Jaroska 16 Mar. 1981 16 p Presented at the 1981 Fuze Sect. Ann. Meeting (ADPA), San Diego, Calif., 17-18 Mar. 1981

(Contract W-7405-eng-48)

(UCRL-85730; CONF-810367-2) Avail: NTIS HC A02/MF A01

A critical problem area in hard target penetration weapons development programs is the extreme difficulty of measuring acceleration-time data from penetration tests due to the hostile nature of the environment. The development of a small, rugged, solid state on-board recorder to capture dynamic data for hard target penetration weapon testing is described. DOE

N81-30423# Los Alamos Scientific Lab., N. Mex.

OUT-OF-FOCUS INTENSITY DISTRIBUTION: EFFECTS OF FOCAL NUMBER AND ABERRATION

George A. Kyrala 1981 7 p refs Presented at Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981

(Contract W-7405-eng-36)

(LA-UR-81-1439; CONF-810429-25) Avail: NTIS HC A02/MF A01

Modification of the incident laser energy distribution by working out of the focal plane is investigated. The intensity distributions for two focal lengths (78 and 132 cm) and various measured optical distortions (phase only) for the focusing optics are analyzed using a fast Fourier method. A 78 cm element produced more uniform spots of diameter 500 microns. The 132 cm element was less sensitive to focusing/positioning error than the 78 cm element. DOE

N81-30424# Tennessee Univ., Knoxville. Nuclear Engineering Dept.

THEORETICAL CHARACTERIZATION OF A DUAL PURPOSE GAMMA THERMOMETER

J. O. Johnson and T. J. Burns (ORNL) 1981 6 p refs Presented at the Am. Nucl. Soc. Ann. Meeting, Miami Beach, Fla., 7-12 Jun. 1981

(Contract W-7405-eng-26)

(CONF-810606-51) Avail: NTIS HC A02/MF A01

The gamma thermometer (G.T.) is evaluated for measuring the local heat generation rate (LHGR) in a pressurized water reactor and as a fluid level indicates for in core measurements. The gamma thermometer is described. A theoretical analysis of the feasibility of using the GT to measure power level and fluid level without compromising either function is presented. DOE

N81-30425# National Physical Lab., Teddington (England). Div. of Quantum Metrology.

THE CALIBRATION OF RADIATION PYROMETERS,

BLACKBODY SOURCES AND STANDARD LAMPS
P. B. Coates Jan. 1981 45 p refs
(NPL-QU-61; ISSN-0309-3050) Avail: NTIS HC A03/MF A01

Procedures for the calibration of the different types of radiation pyrometers and of the standard sources of thermal radiation are described. Techniques which enable calibration laboratories to establish traceability to the national standards through the routine measurement services offered are given, together with a review of the factors governing the selection of an appropriate technique. Dissemination of the International Practical Temperature Scale (IPTS-68) through a chain of comparison procedures necessarily leads to an increase in the overall calibration uncertainty at each stage. The sources of errors in pyrometric measurements, and the estimation of the contribution of each to the total uncertainty, are discussed quantitatively.
Author (ESA)

N81-30426# National Bureau of Standards, Washington, D.C. Electromagnetic Fields Div.
A TEMPERATURE PROBE FOR RADIO-FREQUENCY HEATED MATERIAL
Ronald R. Bowman Jan. 1981 34 p refs
(PB81-176125; NBSIR-80-1634) Avail: NTIS HC A03/MF A01 CSCL 14B

An approach to measuring temperature in radio frequency heated materials is described which employs thermistor sensors convected to suitable electronic by means of leads of very slight thermal conductivity. Four leads are used to allow the thermistor resistance to be sensed despite the large and unstable lead resistance. Both theory and results are presented to illustrate the effectiveness of the entire approach. GRA

N81-30427# National Bureau of Standards, Washington, D.C.
CALIBRATION AND RELATED MEASUREMENT SERVICES OF THE NATIONAL BUREAU OF STANDARDS
L. J. Kieffer Mar. 1981 116 p refs Supersedes NBS-SP-250-1978
(PB81-176968; NBS-SP-250-1980; LC-63-60099; NBS-SP-250-1978) Avail: NTIS HC A06/MF A01 CSCL 14B

Detailed descriptions of the currently available NBS calibration services, measurement assurance programs, and other measurement services are described. Each section describing specific services contains references to additional publications giving more detail about the measurement techniques and procedures used. The services available as of the second quarter of 1980 are considered. J.D.H.

N81-31084*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TEMPERATURE STABILIZED PHASE DETECTOR
Yeeman Lo *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 90-95 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N81-30428*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
THEORETICAL STUDIES OF SOLAR-PUMPED LASERS Progress Report, 15 Jan. - 15 Jul. 1981
Wynford L. Harries Aug. 1981 33 p refs
(Grant NsG-1568)
(NASA-CR-164681; PTR-81-9) Avail: NTIS HC A03/MF A01 CSCL 20E

Estimates of the absorption and emission characteristics of molecules required to develop materials for solar-pumped lasers are addressed. These characteristics are described in terms of the Franck Condon factors, which are calculated from the molecular wave functions. Wave functions for vibrational levels in the lower and upper electronic states of I2 and NSe are calculated numerically and methods of checking errors discussed. Errors arise when the vibrational quantum numbers are high: but, using a calculated rather than measured value of the dissociation energy, wave functions up to the fiftieth vibrational level are obtained. A numerical method of evaluating the wave functions is given, which should be more accurate in the region of electronic transitions during absorption. Franck Condon factors, plotted versus the wavelength of the absorbed photons, are shown, and a check on the Franck Condon factors is made using the vibrational sum rule. J.M.S.

N81-30429# Laser Diode Labs., Inc., New Brunswick, N.J.
INJECTION LASER DIODES FOR FIBER OPTIC COMMUNICATIONS Final Report, 30 Jul. 1976 - 28 Feb. 1981
Albert Gennaro 31 Mar. 1981 157 p
(Contract DAAB07-76-C-0040)
(AD-A101481; CORADCOM-76-0040-F) Avail: NTIS HC A08/MF A01 CSCL 09/1

The design and fabrication of injection laser diodes for use in fiber optic communications is discussed with regard to material synthesis, chip configuration, and device assembly in manufacturing environment. The opto-electronic source is based on the GaAs-GaAlAs double heterojunction structure and consists of a parallel array of lasers formed by the application of triple strip geometry to the surface of the epitaxial wafer. The monolithic triand of discrete lasing elements is mounted in a high frequency package which incorporates a high quality optical window.
Author (GRA)

N81-30430# KMS Fusion, Inc., Ann Arbor, Mich.
TIME-RESOLVED SPECTRUM OF LIGHT REFLECTED FROM LASER PLASMAS
J. A. Tarvin and R. J. Schroeder Aug. 1980 16 p refs Presented at the 22nd Ann. Meeting of the Div. of Plasma Phys. of the APS, San Diego, Calif., 10 Nov. 1980
(Contract DE-AC08-78DP-40030)
(KMSF-U-1033; CONF-801119-4) Avail: NTIS HC A02/MF A01

The time dependent spectrum of 1.054 micrometer light reflected from spherical targets was measured for intensities in the range between 0.4 and 10 x 10 to the 15th power W/sq cm. The spectra are primarily blueshifted and are consistent with a Doppler-shift model. When compared with hydrodynamic code simulations, they provide valuable information on flux-limited thermal transport and suprathermal electron transport. DOE

N81-30431# Los Alamos Scientific Lab., N. Mex.
MODELING THE CF4 LASER
C. W. Patterson, R. S. McDowell, B. J. Krohn, and N. G. Nereson 1981 9 p refs Proceedings of the Conf. on Optics, Santa Fe., N. Mex., 6 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1197; CONF-810429-9) Avail: NTIS HC A02/MF A01

Quantitative intensity and line broadening studies on CF4 and their application to modeling the laser gain is presented. First, absorption measurements on isolated lines in the v sub 2 + v sub 4 pump band at a series of pressures yield an effective transition dipole moment for this band of 0.010 Debye. At the same time the transition moment for the v sub 2 + v sub 4 - v sub 2 laser band are calculated and agrees well with the results of laser self-absorption measurements. Finally, linewidths determined as a function of pressure yield a pressure broadening coefficient of ca. 10 MHz/torr, significantly greater than that expected from a hard sphere gas kinetic model. From these data the gain of the CF4 laser are calculated at various pressures and temperatures; the results are in reasonable agreement with measured values. DOE

N81-30432# Stanford Linear Accelerator Center, Calif.
FREE ELECTRON LASERS
P. Morton Feb. 1981 5 p refs Presented at the Particle Accelerator Conf., Washington D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-Pub-2679; CONF-810314-126) Avail: NTIS HC A02/MF A01

The various operating modes of the free electron laser (FEL) are discussed. The equations of motion for a single electron moving through a wiggler in the presence of an electromagnetic

wave propagating along the wiggler axis were derived. The similarity of the equations to those studied by the accelerator physics is demonstrated. Acceleator methods are used to discuss the present FEL designs. DOE

N81-30433# Los Alamos Scientific Lab., N. Mex. Dept. of Chemistry.
PRESSURE AND POWER DEPENDENCE IN THE INFRARED LASER PHOTOLYSIS OF 1-CHLORO-1-FLUOROETHYLENE EXPERIMENT AND MODELING CALCULATIONS
N. S. Nogar and W. A. Jalenak (Nebraska Univ., Lincoln) 1981 8 p refs Presented at Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1172; CONF-810429-19) Avail: NTIS HC A02/MF A01

Dissociation of 1-chloro-1-fluoroethylene following infrared multiphoton excitation was monitored via infrared fluorescence of the products, either HCl^* or HF^*. Total dissociation yield and branching ratio were monitored as functions of pressure and photolytic intensity. It is shown that a rate equations model of the excitation and dissociation process are consistent with both sets of data. DOE

N81-30434# Los Alamos Scientific Lab., N. Mex.
ANTARES ALIGNMENT GIMBAL POSITIONER
R. D. Day, V. K. Viswanathan, A. C. Saxman, R. E. Lujan, W. C. Woodfin, and W. C. Sweatt 1981 7 p refs Presented at the Conf. of Optics Meeting of the Am. Phys. Soc., Santa Fe, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1394; CONF-810429-28) Avail: NTIS HC A02/MF A01

Antares is a 24-beam 40-TW carbon dioxide (CO2) laser fusion system currently under construction at the Los Alamos National Laboratory. The Antares alignment gimbal positioner (AGP) is an optomechanical instrument that will be used for target alignment and alignment of the 24 laser beams, as well as beam quality assessments. The AGP will be capable of providing pointing, focusing, an wavefront optical path difference, as well as aberration information at both helium neon (He-Ne) and CO2 wavelengths. It is designed to allow the laser beams to be aligned to any position within a 1 cm cube to a tolerance of 10 micrometers. DOE

N81-30435# Los Alamos Scientific Lab., N. Mex.
TEMPORAL SHAPING OF NANOSECOND CO2 LASER PULSES IN MULTIPHOTON SATURABLE ABSORBERS
Richard F. Haglund, Jr. 1981 23 p refs Presented at the 1981 Los Alamos Conf. on Optics, 6-10 Apr., Santa Fe, N. Mex.
(Contract W-7405-eng-36)
(LA-UR-81-1404; CONF-810429-29) Avail: NTIS HC A02/MF A01

It was shown that substantial temporal distortion of nanosecond 10.6 micrometer laser pulses occurs in traversing multiphoton saturable absorbers. The risetime and pulse delay effects appear to depend both on fluence and wavelength, and to be qualitatively consistent with predictions of a simple two level absorption model. DOE

N81-30436# Los Alamos Scientific Lab., N. Mex.
IN-SITU OPTICAL BREAKDOWN: STUDIES FOR A LARGE CO2 LASER AMPLIFIER
C. J. Elliott, R. G. Bjurstrom, J. P. Carpenter, E. L. Coffelt, J. J. Hayden, D. E. Hebron, J. McLeod, and V. Romero 1981 4 p refs Presented at the Conf. on Optics, Los Alamos, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1245; CONF-810429-13) Avail: NTIS HC A02/MF A01

Optical breakdown from target reflected optical pulses in the Gemini laser system was studied. The retropulse fluence (or illuminance) leaving the amplifier was measured in terms of the energy entering the breakdown region and qualitative agreement but no quantitative agreement with theory was found. Particulates were observed on nucleopore filters through which gas samples were drawn. DOE

N81-30437# Los Alamos Scientific Lab., N. Mex.
SMALL-SIGNAL-GAIN SPECTRUM OF AN 1800 TORR CO2 AMPLIFIER
J. C. Goldstein, R. F. Haglund, Jr., and J. C. Comly, Jr. 1981 12 p refs Presented at Los Alamos Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981
(LA-UR-81-1232; CONF-810429-11) Avail: NTIS HC A02/MF A01

Prominent hot band effects were observed in the 9.4 and 10.6 micrometer gain spectrum of an 1800 Torr electron beam controlled discharge CO2 laser amplifier. The data are in good agreement with theoretical calculations at 53 different frequencies. DOE

N81-30438# Los Alamos Scientific Lab., N. Mex.
LASER DAMAGE TESTING OF COATED REFLECTORS AT EXCIMER LASER WAVELENGTHS
S. R. Foltyn and B. E. Newman 1981 11 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1567; CONF-810429-33) Avail: NTIS HC A02/MF A01

An important parameter in the design of large scale ultraviolet lasers (such as those envisioned for Inertial Confinement Fusion and Molecular Laser Isotope Separation) is the resistance to optical damage of windows, AR coatings, and coated reflectors. The damage thresholds of a variety of 248 nm, and 351 nm reflectors were measured. The coatings were composed of quarterwave stacks of oxide and/or fluoride films deposited on Suprasil 2 substrates. Testing was accomplished at 35 Hz with nominal 10 as pulses focused to a mean 1/sq e diameter of 0.5 to 0.6 mm. Damage threshold (defined as the highest fluence at which 10/10 sites survived 1000 shots) ranged from 1 to 5 J/sq cm with a strong dependence upon laser wavelength and reflector coating materials. DOE

N81-30439# Los Alamos Scientific Lab., N. Mex.
DESIGN AND CONSTRUCTION OF A SHORT-PULSE FRONT END FOR A LARGE CO2 LASER
C. W. Woods, R. F. Alexander, and C. R. Collins 1981 6 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 5 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1441) Avail: NTIS HC A02/MF A01

A CO2 laser oscillator, switch out, and preamplifier system which produces 1 ns pulses of 10.6 micrometers light with an energy of about 1 joule was designed and constructed. Commercial CO2 transversely-excited-atmospheric pressure devices were used throughout. Alignment was simplified by using a single He-Ne laser and penta prism reflectors on kinematic mounts. Performance of this system as compared with calculations with the Laser Optical Train simulation program is discussed. DOE

N81-30440# Los Alamos Scientific Lab., N. Mex.
SUB-NANOSECOND JITTER, REPETITIVE IMPULSE GENERATORS FOR HIGH RELIABILITY APPLICATIONS
G. J. Krausse and W. J. Sarjeant 1981 7 p refs Presented at 3rd IEEE Intern. Pulsed Power Conf., Albuqueque, N. Mex., 1-3 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1655; CONF-810659-3) Avail: NTIS HC A02/MF A01

The research and development of very low jitter (< 30 ps), multikilovolt generators for high reliability, minimum maintenance trigger applications utilizing a class of high pressure tetrode thyratrons are described. The overall system design philosophy is described followed by a detailed analysis of the subsystem component elements. A multivariable experimental analysis of this tetrode thyratron was undertaken, in a low inductance configuration, as a function of externally available parameters. For specific thyratron trigger conditions, rise times of 18 ns into 6.0 Ohm loads were achieved at jitters as low as 24 ps. Using this data base, an integrated trigger generator system with solid state front end is described in some detail. DOE

N81-30441# Centre d'Etudes et de Recherches, Toulouse (France). Dept. d'Etudes et de Recherches en Optique.
TWO FREQUENCY DYE LASER OSCILLATOR [OSCILLATOR

LASER A COLORANT BI-FREQUENCES]
Yvan Aubry Dec. 1980 34 p refs In FRENCH
(CERT-8/6069-RO) Avail: NTIS HC A03/MF A01

Two frequencies were obtained in a dye laser system by changing the incidence angle on the refraction network. The two polarized beams are separated using a Pockels cell and a Glans prism. The experimental device is described. The applications of an atmospheric Lidar could be extended in this way to differential absorption experiments. The results obtained, using four different dyes are included. The performance of the laboratory prototype is satisfactory and the demonstrated efficiency suggests the possibility of multiple uses with a minimum of dyes.
Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N81-30442*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
THE 34-METER ANTENNA DRIVE CONTROL SYSTEM
8 Jul. 1981 30 p Prepared for JPL
(Contracts NAS7-100; JPL-955945)
(NASA-CR-164683; WDL-TR9153; JPL-9950584) Avail: NTIS HC A03/MF A01 CSCL 13I

Detailed definitions of the baseline antenna drive and control/instrumentation equipment for 34 meter antennas included in Network Consolidation Program of the Deep Space Network are presented. The overall antenna control and monitor system and its interfaces with other higher level control and monitor equipment is described. Explicit descriptions of the antenna axis drive motors and motor controllers, the axis angle encoding systems, and miscellaneous antenna located components are presented, and related to system functional and performance requirements. Some potential alternates to the baseline system configuration are described and discussed. J.D.H.

N81-30443# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
THE WAVY MECHANICAL FACE SEAL THEORETICAL AND EXPERIMENTAL RESULTS Summary Report, 1 Dec. 1979 - 30 Nov. 1980
A. O. Lebeck and L. A. Young Jan. 1981 271 p refs
(Contract N00014-76-C-0071)
(AD-A101732; ME-111(81)ONR-414-1) Avail: NTIS HC A12/MF A01 CSCL 11/1

This report presents results of theoretical and experimental investigations on the effects of waviness on mechanical face seal performance. Previous work showed how waviness imposed on a seal face leads to reduced friction and wear while creating only a small leakage in a water seal. It was also shown that the waviness must be moved slowly around the seal ring in order that the effect of waviness remain indefinitely. A new device for creating a moving wave with no internal moving parts is described. Experimental results show that the device operates reliably. Results from wavy seal experiments which used this device show that a moving wave can reduce wear by at least a factor of 200 compared to a flat face seal. A model for a wavy seal is presented and refined using the Elrod algorithm for determining cavitation. Predicted results for the wavy seal compare favorably to experimental results. Optimum wavy seal design conditions including the number of waves are established. Theoretical and experimental results are given on the effects of radial taper and high temperature operation on seal performance. Thermal rotation is evaluated experimentally and predicted theoretically. A converging radial taper greatly reduces seal friction and wear during initial operation. Results show how wear progresses across the face. High temperature operation reduces seal friction. A new concept of a self-forming offset-land seal is described. One ring of the seal continually machines an optimum shape into the mating face. GRA

N81-30444# Bettis Atomic Power Lab., West Mifflin, Pa.
FORCES IN BOLTED JOINTS: ANALYSIS METHODS AND TEST RESULTS UTILIZED FOR NUCLEAR CORE APPLICATIONS (LWBR DEVELOPMENT PROGRAM)
P. J. Crescimanno and K. L. Keller Mar. 1981 158 p refs
(Contract DE-AC11-76PN-00014)
(WAPD-TM-1349) Avail: NTIS HC A08/MF A01

Analytical methods and test data employed in the core design of bolted joints for the light water breeder reactor core are presented. The effects of external working loads, thermal expansion, and material stress relaxation are considered in the formulation developed to analyze joint performance. Extensions of these methods are also provided for bolted joints having both axial and bending flexibilities, and for the effect of plastic deformation on internal forces developed in a bolted joint. Design applications are illustrated by examples. DOE

N81-30445# Westinghouse Electric Corp., Tampa, Fla. Nuclear Equipment Div.
DEVELOPMENT OF AUTOMATED WELDING PROCESS FOR FIELD FABRICATION OF THICK WALLED PRESSURE VESSELS Quarterly Report, FY 1981
U. A. Schneider 1981 6 p
(Contract DE-AC05-78ET-13511)
(DOE/OR-13511/T1; QR-2) Avail: NTIS HC A02/MF A01

Progress is reported on welding processes, laboratory adaptation of the narrow groove process to the vertical and horizontal welds, 8-in. field demonstration/qualification welds in vertical and horizontal positions, and welding procedure handbook. DOE

N81-30446# Sandia Labs., Livermore, Calif. Combustion Applications Div.
EXPERIMENTAL INVESTIGATION INTO THE APPLICATION OF SPONTANEOUS RAMAN SCATTERING TO SPRAY MEASUREMENTS IN AN ENGINE
Sheridan C. Johnston Apr. 1981 14 p refs Presented at the Central States Sect. 1981 Spring Tech. Meeting, Warren, Mich. 23-24 Mar. 1981 and at ASME Fluid Mech. of Combust. Systems Symp., Boulder, Colo., 22-24 Jun. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-8642; CONF-810621-2) Avail: NTIS HC A02/MF A01

The use of spontaneous Raman scattering as a laser probe for precombustion engine spray measurements was investigated for a continuous-wave laser system. Particular emphasis was placed on spectroscopic distinction between the liquid and vapor phase of the fuel; spray fouling of windows; laser transmission through the spray; and laser-droplet induced background. A technique for vapor temperature measurement in precombustion, vaporizing fuel sprays was derived and applied. Mie scattering was used to complement the Raman measurements. Results of the study indicate that vibrational Raman scattering alone cannot distinguish between liquid and vapor phase propane fuel, at least for the spectral resolution found to be most useful in engine mixing studies. DOE

N81-30447# Rockwell International Corp., Golden, Colo.
AUGER ELECTRON SPECTROSCOPY APPLIED TO BRAZE WETTABILITY
R. L. Chin and D. T. Larson 1981 17 p refs Presented at the Am. Vacuum Soc. Rocky Mt. Chapter Meeting, Denver, 4 May 1981
(Contract DE-AC04-76DP-03533)
(RFP-3202; CONF-810537-1) Avail: NTIS HC A02/MF A01

While atomically clean metal surfaces are not necessary for good wettability, excessive oxygen (metal oxide) and/or carbon contaminants will leave non-wettable surfaces. The causes of non-wettable surfaces during brazing were examined utilizing Auger electron spectroscopy. This surface spectroscopy with a sampling depth of 10 to 20A combined with sputter etching to provide film profiles was used to examine non-wettable specimens. Three different systems were studied. In the first case, carbon was found to segregate from the bulk to the surface of a nickel-copper alloy (Monel) during the braze heating. The formation of a graphitic layer was responsible for the non-wettability. In the second case, an external carbon contaminant was found on the surface of 316 stainless steel and resulted in a non-wettable surface. In the third situation, the non-wettability of 304 stanless steel was caused by a thick oxide film which formed in vacuum during brazing. DOE

N81-30448# Sandia Labs., Albuquerque, N. Mex. Transportation Technology Center.
PROPOSED DESIGN REQUIREMENTS FOR HIGH-INTEGRITY CONTAINERS USED TO STORE, TRANSPORT, AND DISPOSE OF HIGH SPECIFIC ACTIVITY, LOW LEVEL RADIOACTIVE WASTES FROM THREE MILE ISLAND UNIT 2
M. G. Vigil, G. C. Allen, and R. B. Pope Apr. 1981 48 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0567; TTC-0198) Avail: NTIS HC A03/MF A01

Design requirements are proposed for high integrity containers used to store, transport and/or dispose of high activity, low level radioactive wastes from Three Mile Island Unit II. The wastes considered are the dewatered resins produced by the EPICOR II waste treatment system used to clean up the auxiliary building water. The radioactivity level of some of these EPICOR II liners is 1300 curies per container. These wastes may be disposed of in an intermediate depth burial (10 to 20 meter depth) facility. The proposed container design requirements are directed to ensure isolation of the waste and protection of the public health and safety. DOE

N81-30449# Oak Ridge National Lab., Tenn. Engineering Technology Div.
SUMMARY OF RESEARCH AND DEVELOPMENT EFFORT ON CLOSED-CYCLE GAS TURBINES
A. P. Fraas Jun. 1981 39 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6237) Avail: NTIS HC A03/MF A01

The advantages of the closed cycle gas turbine over the open cycle turbine are discussed. The turbine utilizes dirty fuels such as residual fuel oil, coal, or lignite and there is no loss in thermal efficiency at part load, and waste heat can be rejected at temperatures up to 3700 C for use in industrial processes. The disadvantage of the system is that the peak turbine inlet temperature is limited to approx. 8150 C by stress and corrosion in the heat exchanger between the combustion products and the turbine working fluid. If a dirty fuel is used for cogeneration applications where the ratio of the heat energy required to the electrical energy produced is less than 4, particularly if the heat is required at temperatures greater than 1000 C, both the efficiency of utilization of the energy in the fuel and the capital costs are more attractive for a closed cycle gas turbine than for a steam system. DOE

N81-30450# General Electric Co., St. Petersburg, Fla.
PERFORMANCE OF AIR-COOLED POWER PLANTS USING GAS FROM COAL Final Report
S. D. Shemo May 1981 154 p refs Sponsored by EPRI
(EPRI Proj. 986-3)
(EPRI-AP-1844) Avail: NTIS HC A08/MF A01

The thermal performance and water use of various power plants using coal gasification systems integrated with combustion turbines and under minimum water use conditions are determined. The gasifiers considered are the oxygen blown gasifier, the oxygen blown slagging gasifier, and air blown gasifiers. These gasifiers are each integrated with simple combustion turbine cycles, regenerative combustion turbine cycles and combined cycles. The performance of these dry cooled integrated plants is compard to that of wet cooled integrated gasification combined cycle systems and conventional coal fired plants. DOE

N81-30451# Westinghouse Research and Development Center, Pittsburgh, Pa.
PREDICTIONS OF COMBUSTION TURBINE PREFORMANCE IN PRESSURIZED FLUIDIZED-BED COMBUSTION POWER PLANTS Final Report
R. A. Wenglarz, M. A. Alvin, and S. J. Schneider May 1981 142 p refs Sponsored by EPRI
(EPRI Proj. 1336-1)
(EPRI-CS-1845) Avail: NTIS HC A07/MF A01

An assessment is given of tolerances for utility turbines operating with pressurized fluidized bed combustion (PFBC) power plants. Differences between erosion environments produced in large utility turbines and cascades or small turbines are explored to evaluate the extent which cascade and small turbine test results indicate erosion tolerances of large utility turbines. Experimental data are complemented with mechanistic analyses to describe general erosion/deposition/corrosion potential characteristics expected for PFBC power plant turbines and to evaluate tolerances for two existing utility turbines, each operating with a specific PFBC power plant. Intervals for turbine maintenance due to erosion and deposition degradations are projected for alternative particulate cleanup systems used with each plant. Effects of combustor operating conditions (excess air levels and sulfur removal efficiencies) on turbine corrosion/deposition potential are explored. Turbine design modifications are identified which might improve tolerances to PFB combustion gases and potentially increase turbine reliability and reduce gas cleanup and turbine maintenance costs. DOE

N81-30452# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY FLOW IN HIGH SPEED PERFORATION AND CUTTING
M. vanThiel 7 Oct. 1980 17 p refs Presented at the 31st Aeroballistic Range Assoc. Conf., Pasadena, Calif., 7 Oct. 1980
(Contract W-7405-eng-48)
(UCRL-85016; CONF-8010185-1) Avail: NTIS HC A02/MF A01

It is demonstrated that effects of long penetrators on targets can be modeled by introducing a high pressure (energy) column on the penetration path in place of the projectile. This energy ca be obtained from the kinetic energy of the penetrator; the equation of state of the materials used and a Bernouli penetration condition. The model is supported by detailed hydro calculations. DOE

N81-30453# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
ELEVATED TEMPERATURE MECHANICAL PROPERTIES OF A FLUX-CORED ARC ELEMENT
M. G. Cowgill and K. C. Thomas 1981 18 p Presented at the 110th AIME Ann. Meeting, Chicago, 22-26 Feb. 1981
(Contract DE-AC15-76CL-02395)
(CONF-810203-12) Avail: NTIS HC A02/MF A01

Normal operating conditions for a liquid metal fast breeder reactor include temperatures up to 65 C but the effects of a high temperature (up to 590 C) sodium spill may result in temperatures as high as 927 C due to possible exothermic reactions. The mechanical property data available on this material and weldments of it are mostly limited to temperatures of 593 C and below. A program was initiated to obtain the required short term tensile properties, as a function of strain rate and temperature, and limited creep rupture properties of SA 516 (grade 55) carbon steel used for cell liners. All the tests were to be performed in air due to the unfeasibility of trying to duplicate the environmental possibilities which can occur during a sodium spill. The tensile and creep property data on the weldment are reported. DOE

N81-30454# Imperial Coll. of Science and Technology, London (England). Heat Transfer Section.
COMPUTER MODELING OF INTERNAL COMBUSTION ENGINES: COMBUSTION AND RELATED PROCESSES
D. B. Spalding Jun. 1979 37 p refs
(HTS/79/3) Avail: NTIS HC A03/MF A01

Gas-flow, heat transfer and chemical-reaction processes taking place in the internal combustion (IC) cylinder are studied. Two-phase processes in the inlet manifold are examined together with the possibility of calculating spark-ignition processes, using a computer model. Other problems investigated include predicting the rate of propagation of turbulent flames, and studying the situation when the rate of combustion is determined by the mixing of two bodies of gas of differing fuel-air ratio, either with or without the additional influence of chemical kinetics. Two-phase processes, the quenching of gases, and exhaust processes are also examined. It is argued that the advent of economical three-dimensional computer programs has significantly increased the extent to which the design of IC engines can optimize designs. Author (ESA)

N81-30455# National Centre of Tribology, Risley (England). European Space Tribology Lab.
THE TORQUE BEHAVIOUR OF GREASE-LUBRICATED

ANGULAR CONTACT BEARINGS OPERATING AT LOW SPEEDS
K. T. Stevens Paris ESA 1981 24 p ref Sponsored by ESA
(ESA-ESTL-46; ESA-CR(P)-1423) Avail: NTIS HC A02/MF A01

The low speed torque behavior of bearings using a very low vapor pressure grease (Braycote 3L 38 RP) was investigated and its performance compared with that of other (fluid) space lubricants. Bearings were cleaned, preloaded and 100 mg of grease applied. After a run-in period bearings were run at 1 rpm or less and the torque noise measured as a function of time with a fast response galvanometer recorder. Race and ball surfaces were examined microscopically. Tests were run with BP 8135, BP 2110, Andok C, Isoflex PDB38 and Beacon 325. The base oil of the Braycote grease, Fomblin Z25 gave satisfactory performance. These were Andok C and Isoflex BDB38. In slow speed applications where low torque, low torque noise and a low vapor pressure are all requirments, Fomblin Z25 oil is recommended for use in preference to the Braycote grease.
Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N81-30456# Oak Ridge Gaseous Diffusion Plant, Tenn. Analytical Chemistry Dept.
ANALYSIS OF SOLDERS BY X-RAY FLUORESCENCE SPECTROMETRY
A. A. Halouma Apr. 1981 37 p refs
(Contract W-7405-eng-26)
(K-2020) Avail: NTIS HC A03/MF A01

Conditions were established for determining cadmium, copper, lead, nickel, silver, tin, and zinc in different solders by X-ray fluorescence spectrometry. The feasibility of determining the concentrations of the constituent elements in the presence of each other at any level of concentration was demonstrated. DOE

N81-30457# Argonne National Lab., Ill. Materials Science Div.
DEVELOPMENT OF NONDESTRUCTIVE-EVALUATION TECHNIQUES FOR HIGH-TEMPERATURE CERAMIC HEAT-EXCHANGER COMPONENTS Semiannual Report, Oct. 1980 - Mar. 1981
D. S. Kupperman, M. J. Caines, D. Yuhas (Sonoscan, Inc., Bensenville, Ill.), C. Sciammarella (Illinois Inst. of Tech.), and L. Spevak (Sonoscan, Inc., Bensenville, Ill.) Apr. 1981 45 p refs
(Contract W-31-109-eng-38)
(ANL/MSD/FE-81-1) Avail: NTIS HC A03/MF A01

Development of the ultrasonic bore-side probe, application of acoustic microscopy techniques to ceramic joint assessment, quantification of holographic interferometry to obtain flaw size information, and evaluation of rod anode microfocus radiography for ceramic butt joint assessment are discussed. DOE

N81-30458# California Univ., Livermore. Lawrence Livermore Lab.
RELIABILITY STUDIES OF MATERIALS USING SEVERAL LST-11 BASED SYSTEMS
Kenneth A. Gertz 2 Apr. 1981 5 p Presented at the Spring DECUS U.S. Symp., Miami Beach, 18-21 May 1981 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-85254; CONF-810546-1) Avail: NTIS HC A02/MF A01

Valid predictions about the reliability of materials require tests on a large number of samples. The materials must undergo a number of different types of load histories in order to make an accurate definition of the damage function. At LLNL, a test facility was designed that allows material testing of strength and life to be done at the different load histories. The facility uses several LSI-11 microcomputers as multichannel data acquisiton systems. Currently, each system operates independently using floppy disks as program and data storage. The floppy disks containing the data are hand carried to a PDP-11/60 minicomputer for data analysis. Each system uses an analog-to-digital (A/D) converter selected to best fit the characteristics of the signal being measured; i.e., a high speed direct memory access (DMA) A/D for signals with fast rise times, an integrating A/D for signals with an ac component, etc. DOE

N81-30459# National Bureau of Standards, Washington, D.C.
ADVANCEMENT OF RELIABILITY, PROCESSING AND AUTOMATION FOR INTEGRATED CIRCUITS WITH THE NATIONAL BUREAU OF STANDARDS (ARPA/IC/NBS) Final Report, Jan. 1973 - Oct. 1979
W. M. Bullis Mar. 1981 51 p refs
(PB81-188203; NBSIR-81-2224) Avail: NTIS HC A04/MF A01 CSCL 09E

The measurement technology necessary to enable device manufacturers to exert more effective control over the materials and processes they use to make integrated circuits with the ultimate aim of providing increased reliability at reasonable cost is described. Work was carried out in 12 technical areas: resistivity and dopant characterization; crystal defects and contaminants; oxides and other insulator films; physical analysis techniques; film and layer thickness; materials for infrared detector arrays; materials and procedures for water processing photolithography; microelectronic test patterns; water inspection and test; die and interconnection bonding; and hermeticity. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N81-30460 Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 13, NO. 7
Jul. 1981 70 p refs
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set

Methods applicable to the analysis of vibration in plates and machine tools are discussed. Approximately 171 abstracts from the current literature are given in the following categories: mechanical systems, structural systems, vehicle systems, biological systems, mechanical components, structural components, electric components, dynamic environment, mechanical properties, experimentation, and analysis and design. For individual titles, see N81-30461 through N81-30462.

N81-30461# Indian Inst. of Tech., Madras.
MACHINE TOOL VIBRATION: A REVIEW
V. Ramamurti and V. Srinivasan (Oklahoma State Univ., Stillwater) *In* Shock and Vibration Information Center The Shock and Vibration Dig., Vol. 13, No. 7 Jul. 1981 p 3-8 refs (For primary document see N81-30460 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set

Analytical and experimental methods for assessing machine tool vibration are summarized. Methods for dealing with vibration isolation, damping, chatter, and noise are included. J.M.S.

N81-30462# Silesian Technical Univ., Gliwice (Poland). Dept. of Mathematics and Physics.
METHOD OF R-FUNCTIONS AND ITS APPLICATION TO ANALYSIS OF VIBRATIONS OF PLATES AND OTHER STRUCTURES
A. Waberski *In* Shock and Vibration Information Center The Shock and Vibration Dig., Vol. 13, No. 7 Jul. 1981 p 11-14 refs (For primary document see N81-30460 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20374; $15.00/set

The method of R-functions, a method to solve value boundary problems of complex form in mathematical physics, is described. This method also has wide application to analysis of vibrations of plates and other complex structures. J.M.S.

N81-30463 Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 13, NO. 6
Judith Nagle-Eshleman, ed. Jun. 1981 97 p refs
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set

The dynamic response of shells to multifrequency excitation is addressed. Approximately 230 abstracts from the current literature are given in the following categories: mechanical systems; structural systems; vehicle systems; biological systems; mechanical components; structural components; electric components; dynamic environment; mechanical properties; experimentation; and analysis and design. For individual titles, see N81-30464 through N81-30465.

N81-30464# Columbia Univ., New York. Dept. of Civil Engineering and Engineering Mechanics.
DYNAMIC RESPONSE OF FLUID-FILLED SHELLS: AN UPDATE
F. L. DiMaggio *In* Shock and Vibration Information Center The Shock and Vibration Dig., Vol. 13, No. 6 Jun. 1981 p 3-6 refs (For primary document see N81-30463 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set

A review of papers concerned with the dynamic response of fluid-filled shells is presented. Analytical methods used in the study of fluid-filled shells are included. Cylindrical shells, including finite single shells, coaxial shells, and infinite single shells, are covered as well as spherical shells. J.M.S.

N81-30465# Alabama Univ., University. Dept. of Engineering Mechanics.
VIBRATIONS OF CONICAL SHELLS
C. H. Chang *In* Shock and Vibration Information Center The Shock and Vibration Dig., Vol. 13, No. 6 Jun. 1981 p 9-17 refs (For primary document see N81-30463 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set

A literature review of the vibrations of conical shells is presented. The various formulations and solutions of free and forced vibrations of axisymmetric and asymmetric modes of isotropic and anisotropic conical shells are summarized. Computer programs available for computation of the frequencies and mode shapes of vibrations of conical shells of any configuration are discussed. Author

N81-30466 Michigan State Univ., East Lansing.
PRE- AND POST-BUCKLING BEHAVIOR OF PLATES OF VARIABLE STIFFNESS USING FINITE DIFFERENCES Ph.D. Thesis
Mohammad Ali Barkhordari-Bafghi 1981 269 p
Avail: Univ. Microfilms Order No. 8117208

The Von Karman large deflection equation is applied to plates of variable stiffness. Equilibrium equations and the in-plane compatibility equation are derived. The ordinary finite difference technique is employed to solve the nonlinear coupled partial differential equatons. Two different methods of formulation are considered: (1) in terms of lateral displacement w and a stress function; (2) in terms of displacement components u, v and w. Stiffness variation is implemented in two different ways, either by varying the thickness of the plate with constant E, or by taking a uniform thickness plate of variable E. Both types of stiffness variation are considered. The in-plane displacements on the boundary are examined by considering plates with different in-plane displacement boundary conditions. Several problems with different stiffness variation and boundary conditions are solved. Dissert. Abstr.

N81-30467*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
PHOTOELASTIC TECHNIQUES FOR THE COMPLETE DETERMINATION OF STRESSES IN COMPOSITE STRUCTURES
R. Prabhakaran [1981] 20 p refs
(Contract NCCI-26; Grant NSF CDP-80-16606)
(NASA-CR-164689) Avail: NTIS HC A02/MF A01 CSCL 20K

Three methods of photoelastic analysis are examined. The first method is an extension of the oblique incidence technique in which the model (or the light beam) is rotated about one of the material symmetry axes. In the second method, transmission and reflection photoelastic responses are combined. The third method requires the drilling of small holes and the determination of the fringe orders at selected points on the hole boundary. The three methods are applied to an orthotropic circular disk under diametral compression. Results are compared with strain gage data. R.C.T.

N81-30468*# IIT Research Inst., Chicago, Ill. Materials Technology Div.
THERMAL FATIGUE PERFORMANCE OF INTEGRALLY CAST AUTOMOTIVE TURBINE WHEELS
V. E. Humphreys and K. E. Hofer Jun. 1980 84 p refs
(Contracts NAS3-19696; DE-A101-77CS-51040)
(NASA-CR-165227; DOE/NASA/9696-1; IITRI-M06003-54)
Avail: NTIS HC A05/MF A01 CSCL 20K

Fluidized bed thermal fatigue testing was conducted on 16 integrally cast automotive turbine wheels for 1000-10,000 (600 sec total) thermal cycles at 935/50 C. The 16 wheels consisted of 14 IN-792 + 1% Hf and 2 gatorized AF2-1DA wheels; 6 of the IN-792 + Hf wheels contained crack arrest pockets inside the blade root flange. Temperature transients during the thermal cycling were measured in three calibration tests using either 18 or 30 thermocouples per wheel. Thermal cracking based on crack length versus accumulated cycles was greatest for unpocketed wheels developing cracks in 8-13 cycles compared to 75-250 cycles for unpocketed wheels. However, pocketed wheels survived up to 10,000 cycles with crack lengths less than 20 mm, whereas two unpocketed wheels developed 45 mm long cracks in 1000-2000 cycles. Author

N81-30469*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va.
SOME EXPERIENCES WITH ACTIVE CONTROL OF AEROELASTIC RESPONSE
Jerry R. Newsom and Irving Abel Jul. 1981 19 p refs
(NASA-TM-83179) Avail: NTIS HC A02/MF A01 CSCL 20K

Flight and wind tunnel tests were conducted and multidiscipline computer programs were developed as part of investigations of active control technology conducted at the NASA Langley Research Center. Unsteady aerodynamics approximation, optimal control theory, optimal controller design, and the Delta wing and DC-10 models are described. The drones for aerodynamics and structural testing (DAST program) for evaluating procedures for aerodynamic loads prediction and the design of active control systems on wings with significant aeroelastic effects is described as well as the DAST model used in the wind tunnel tests. A.R.H

N81-30470# McDonnell Aircraft Co., St. Louis, Mo.
EFFECT OF VARIANCES AND MANUFACTURING TOLERANCES ON THE DESIGN STRENGTH AND LIFE OF MECHANICALLY FASTENED COMPOSITE JOINTS. VOLUME 3: BOLTED JOINT STRESS FIELD MODEL (BJSFM) COMPUTER PROGRAM USERS MANUAL Final Report, 15 Feb. 1978 - 15 Apr. 1981
J. M. Ogonowski Apr. 1981 53 p
(Contract F33615-77-C-3140; AF Proj. 2401)
(AD-A101659; AFWAL-TR-81-3041-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 13/5

Static strength methodology and evaluations of joint static and fatigue test data are reported. Analytic studies complement methodology development and illustrate: the need for detailed stress analysis, the utility of the developed 'Bolted Joint Stress Field Model' (BJSFM) procedure, and define model limitations. For static strength data, correlations with analytic predictions are included. Data trends in all cases are discussed relative to joint strength and failure mode. For joint fatigue studies, data

trends are discussed relative to life, hole elongation, and failure mode behavior. GRA

N81-30471# Army Armament Research and Development Command, Watervliet, N. Y.
FATIGUE AND FRACTURE TESTS OF GAS BOTTLE MATERIAL
J. H. Underwood and J. J. Zalinka May 1981 31 p refs
(DA Proj. 1A0-27195-1A)
(AD-A101408; ARLCB-TR-81018) Avail: NTIS HC A03/MF A01 CSCL 11/6

A program of nondestructive inspection, mechanical tests, and fracture mechanics tests was performed on a high pressure air storage bottle. The tests were planned to provide the basis of fracture mechanics life analysis of gas bottles in their service environment. This report describes the procedures and results and gives a preliminary analysis of the results. Author (GRA)

N81-30472# Maryland Univ., College Park. Dept. of Chemical Engineering.
SURFACE EFFECTS ON PLASTIC DEFORMATION Annual Report
Richard J. Arsenault and I. R. Kramer May 1981 43 p refs
(Contract N00014-79-C-0392)
(AD-A101748; Rept-81-1) Avail: NTIS HC A03/MF A01 CSCL 20/11

A computer simulation investigation of a dynamic near-surface dislocation operation resulted in the formation of a hard layer of 10 to 500 microns in thickness. This hard layer disappears with time at room temperature when the stress has been removed, i.e., relaxation. The relaxation time for Cu is approximately 2 weeks; for Fe-Si and Mo the relaxation time is 2 and 10 years, respectively. Author (GRA)

N81-30473# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.
NOTCHED FATIGUE AND FRETTING FATIGUE LIFE OF TEXTURED TITANIUM Final Report
Anthone Zarkades May 1981 14 p refs
(DA Proj. 1L1-62105-AH-84)
(AD-A101653; AMMRC-TR-81-22) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effect of texture, (0002) poles in the transverse direction, on the notched and fretting fatigue life of a Ti-4Al-4V alloy was examined. Notched fatigue and pin-loaded flat fretting fatigue specimens were tested at room temperature in the longitudinal and transverse directions and compared to smooth bar fatigue results. Fractured fretting fatigue specimens were examined with the scanning electron microscope. Indications are that no fretting or notch fatigue anisotropy exists for the transverse type texture and specimen orientations examined. However, as expected, a significant reduction of the fatigue life is displayed for specimens subjected to fretting fatigue. Author (GRA)

N81-30474# McDonnell Aircraft Co., St. Louis, Mo. Structural Research Dept.
EFFECT OF VARIANCES AND MANUFACTURING TOLERANCES ON THE DESIGN STRENGTH AND LIFE OF MECHANICALLY FASTENED COMPOSITE JOINTS. VOLUME 1: METHODOLOGY DEVELOPMENT AND DATA EVALUATION Final Report, 15 Feb. 1978 - 15 Apr. 1981
Samuel P. Garbo and J. M. Ogonowski Apr. 1981 158 p refs
(Contract F33615-77-C-3140; AF Proj. 2401)
(AD-A101657; AFWAL-TR-81-3041-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13/5

Mechanically fastened composite joints were structurally evaluated. The state of the art in design and analysis of bolted composite joints was reviewed. Joint design variables and effects of manufacturing and service anomalies on joint strength were analyzed. Bolted composite joint duriability was also evaluated. Seven critical design variables of manufacturing anomalies were identified. GRA

N81-30475# McDonnell Aircraft Co., St. Louis, Mo. Structural Research Dept.
EFFECT OF VARIANCES AND MANUFACTURING TOLERANCES ON THE DESIGN STRENGTH AND LIFE OF MECHANICALLY FASTENED COMPOSITE JOINTS. VOLUME 2: TEST DATA, EQUIPMENT AND PROCEDURES Final Report, 15 Feb. - 1978 - 15 Apr. 1981
Samuel P. Garbo, J. M. Ogonowski, and H. R. Reiling, Jr. Apr. 1981 145 p
(Contract F33615-77-C-3140; AF Proj. 2401)
(AD-A101658; AFWAL-TR-81-3041-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 13/5

The subject of this program was structural evaluation of mechanically fastened composite joints. Program objectives were: (1) development and verification by test of improved static strength methodology; (2) experimental evaluation of the effects of manufacturing anomalies on joint static strength; and (3) experimental evaluation of joint fatigue life. Program activities included: (1) A literature survey which was performed to determine the state-of-the-art in design and analysis of bolted composite joints; (2) Strength data were obtained through an experimental program to evaluate the effects of twelve joint design variables; (3) Effects of seven manufacturing and service anomalies on joint strength were evaluated experimentally and compared with strength data; (4) Bolted composite joint durability was evaluated; and (5) Required data reduction, methodology development and correlation, and necessary documentation were performed. GRA

N81-30476# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
AEROELASTIC FLUTTER AND DIVERGENCE OF GRAPHITE/EPOXY CANTILEVERED PLATES WITH BENDING-TORSION STIFFNESS COUPLING M.S. Thesis
Steven James Hollowell Jan. 1981 139 p refs
(AD-A101726; AFIT-CI-80-67T) Avail: NTIS HC A07/MF A01 CSCL 20/4

The aeroelastic flutter and divergence behavior of rectangular, graphite/epoxy, cantilevered plates with varying amounts of bending torsion stiffness coupling is investigated for incompressible flow. A general Rayleigh-Ritz formulation is used to calculate flexibility influence coefficients, static deflections, divergence velocities, vibration frequencies, and flutter velocities. Flutter calculations are done using the U-g method. Test plates were constructed and subjected to static, vibration and wind tunnel tests. Wind tunnel tests indicated static deflections, divergence instabilities, bending torsion flutter at low angles of attack, and stall flutter at high angles of attack. Bending stiffness and first bending frequencies showed good agreement between theory and experiment. Torsional stiffness and first torsion frequencies were not accurately predicted by the theory for highly coupled plates. Divergence velocities and reduced flutter velocities showed reasonable agreement between theory and experiment. Test plates with varying amounts of coupling exhibited markedly different stal flutter characteristics. GRA

N81-30477# Washington Univ., St. Louis, Mo. Materials Research Lab.
FATIGUE BEHAVIOR ON COMPOSITE LAMINATES Final Technical Report, 1 Sep. 1979 - Aug. 1980
H. Thomas Hahn and D. G. Hwang Wright-Patterson AFB, Ohio AFWAL Nov. 1980 94 p refs
(Contract F33615-77-C-5053; AF Proj. 2419)
(AD-A101349; AFWAL-80-4172) Avail: NTIS HC A05/MF A01 CSCL 11/4

The main objective of this program during the final reporting period was to investigate the fatigue behavior of a (02/90/ + or - 45)s AS/3501-5A Gr/Ep laminate through proof testing. The primary emphasis was on the delineation of the effect of proof test on the residual strength and life, the establishment of strength-life relations, and the identification of sources of scatter in strength and life. The test program consisted of static tests, tension-tension fatigue tests preceded by proof tests, and examinations of failure characteristics. Major findings can be summarized as follows: (1) Proof tests have little effect on the residual strength and life; (2) A relation exists between strength and life such that a statically stronger specimen has a longer life; (3) A minimum life can be assured by a proof test; (4) A higher odulus is an indication of a higher strength and longer life; (5) What distinguishes a typical static failure mode from a typical fatigue failure mode is the lack of delamination in the former; (6) At a moderate fatigue stress, the failure mode changes from a static failure mode to a typical fatigue failure mode

around 20,000 cycles; and (7) A delamination surface consists of shiny and dull areas. The shiny area has bare fibers whereas the dull area only has fiber traces in the epoxy. Author (GRA)

N81-30478# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

SIMPLIFIED INELASTIC ANALYSIS PROCEDURE TO EVALUATE A BUTT-WELDED ELBOW END

A. K. Dhalla 1981 20 p refs Presented at the ASME PVP Conf., Denver, 21 Jun. 1981

(Contract DE-AC15-76CL-02395)

(CONF-810625-16) Avail: NTIS HC A02/MF A01

In a thin walled piping network, the end of an elbow welded to a straight pipe constitutes one of the highly stressed cross sections that require structural evaluation. Explicit rules are not provided in the ASME Code for structural evaluation of the elbow ovalization and fabrication effects as the welded end. This paper with simplified inelastic analysis to evaluate the elbow cross section welded to the straight pipe. The concept of carry over factors is used to obtain ovalization stresses or strains at the elbow end. The stresses introduced by material and geometric nonuniformities in the fabrication process are then added to the ovalization stresses to complete structural evaluation of the girth butt-welded elbow joint. DOE

N81-30479# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

IMPLICATIONS OF STRESS RANGE FOR INELASTIC ANALYSIS

M. E. Karabin and A. K. Dhalla 1981 11 p refs Presented at the ASME PVP Conf., Denver, 21 Jun. 1981

(Contract DE-AC15-76CL-02395)

(CONF-810625-14) Avail: NTIS HC A02/MF A01

The elastic stress range over a complete load cycle is routinely used to formulate simplified rules regarding the inelastic behavior of structures operating at elevated temperature. The purpose of this paper is to illustrate that it is not the elastic stress range but the stress intensities at specific times during a thermal transient which provide a better insight into the inelastic response of the structure. The specific example of the CRBRP flued head design demonstrates that the temperature differential between various parts of the structure can be changed by modifying the insulation pattern and heat flow path in the structure, without significantly altering the elastic stress range over a complete load cycle. However, the modified design did reduce the stress intensity during steady state elevated temperature operation. This modified design satisfied the inelastic Code criteria whereas the initial design failed to comply with the strain accumulation criterion. DOE

N81-30480# Hanford Engineering Development Lab., Richland, Wash. Plant Analysis Subdiv.

BASE-PLATE EFFECTS ON PIPE-SUPPORT STIFFNESS

B. V. Winkel and F. R. LaSalle 14 Jan. 1981 11 p refs Presented at the ASME PVP Conf., Denver, 21-26 Jun. 1981 (HEDL-SA-2276-FP; CONF-810625-7) Avail: NTIS HC A02/MF A01

Nuclear power plant design methods are described. Base plate flexibility is discussed. Field inspection, test, and analytical techniques used to identify and correct excessively flexible base plates on the Fast Flux Test Facility pipe support structures are described. DOE

N81-30481# Battelle Columbus Labs., Ohio.

SPECIMEN-TEST MACHINE COUPLING AND ITS IMPLICATIONS FOR PLASTIC-DEFORMATION MODELS

J. H. Holbrook, J. C. Swearengen (Sandia National Lab., Livermore, Calif.), and R. W. Rhode (Sandia National Lab., Albuquerque, N Mex.) 1981 36 p refs Presented at the ASTM Conf. on Mech. Testing for Deformation Model Development, Bal Harbour, Fla., 12 Nov. 1980

(Contract DE-AC04-76DP-00789)

(SAND-80-1840C; CONF-801148-5) Avail: NTIS HC A03/MF A01

The specimen machine coupling relation in its exact form for engineering total strain rate, true strain rate, and true plastic strain rate in equations was developed. It is shown that the coupling relation can be used to accurately interpret deformation behavior of machine stiffness characteristics which influence the deformation response of material during tensile testing. The benefits of performing tensile tests in a servocontrolled machine in strain mode for which the machine stiffness is effectively infinite are indicated. It is concluded that this method benefits a strain rate behavior that is not dependent on the current of work hardening behavior of the specimen, minimal plastic strain occurs during stress relaxation tests, and a simpler coupling relation for use in interpreting data. DOE

N81-30482# RE/SPEC, Inc., Rapid City, S. Dak.

ELASTIC-PLASTIC DEFORMATION OF ANHYDRITE AND POLYHALITE AS DETERMINED FROM QUASI-STATIC TRIAXIAL COMPRESSION TESTS

T. W. Pfiefle and Paul E. Senseny May 1981 130 p refs

(Contract DE-AC04-76DP-00789)

(SAND-81-7063) Avail: NTIS HC A07/MF A01

Constant stress rate triaxial compression experiments were performed on specimens of anhydrite and polyhalite at low confining pressure and at two temperatures. The loading rate was 50.0575 MPa/s; the confining pressures were 1, 5, 10, and 20 MPa and the two temperatures were 25 C and 100 C. The specimens were loaded to failure in a soft testing machine so that failure occurred at peak stress. The results were used to construct yield envelopes, failure envelopes and stress-strain curves, and to determine mechanical properties. Yield, determined by the onset of dilatancy, occurs at about sixty percent of peak stress. The effect of temperature on both the yield and failure envelopes is negligible. The polyhalite specimens were found to be about twice as strong as the anhydrite specimens. The stress strain data were fitted to a constitutive law. DOE

N81-30483# Argonne National Lab., Ill.

STRAIN HARDENING AND STRAIN-RATE HARDENING

U. F. Kocks 1980 28 p refs Presented at the ASTM Symp. on Mech. Testing for Deformation Model Develop., Bal Harbor, Fla., 12-13 Nov. 1980

(Contract W-31-109-eng-38)

(CONF-801148-7) Avail: NTIS HC A03/MF A01

The limitations of power law strain hardening and strain rate hardening descriptions are reviewed. It is found that significant advantages can be gained by using, instead, the Voce relation, especially in the modification proposed that accounts for the rate sensitivities of flow stress and of strain hardening. Considerable further predictive value can be derived from differential constitutive relations which can be integrated over arbitrary paths. The material parameters to be measured are the (linear) strain-hardening rate and the rate sensitivity of the flow stress, both as a function of (pre)stress and (current) strain rate. These are history independent over subtantial regimes of unidirectional deformation where a mechanical equation of state exists. DOE

N81-30484# Argonne National Lab., Ill. Materials Science Div.

STATISTICAL TREATMENT OF FATIQUE TEST DATA

D. T. Raske 1980 27 p refs Presented at the USDOE/UKAEA Exchange Meeting on Mech. Properties for FBR Structural Mater., Warrington, England, 22-24 Sep. 1980

(Contract W-31-109-eng-38)

(CONF-8009114-3) Avail: NTIS HC A03/MF A01

Several aspects of fatigue data analysis are presented in order to provide a basis for the development of statistically sound design curves. Included is a discussion on the choice of the dependent variable, the assumptions associated with least squares regression models, the variability of fatigue data, the treatment of data from suspended tests and outlying observations, and various strain-life relations. DOE

N81-30485# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.

FATIGUE TESTING OF COMPOSITE ROTOR BLADES

F. Och 12 Sep. 1980 17 p refs Presented at 51st AGARD Struct. and Mater. Panel on Helicopter Fatigue Life Assessment, Aix-en-Provence, France, 14-19 Sep. 1980

(MBB-UD-308/80-OE) Avail: NTIS HC A02/MF A01

Nonlinear regression analysis used with an equation of Weibull with four material-dependent parameters is employed to derive mean and working S/N curves for strength and endurance

determinations. The corresponding scattering factor is calculated from the fatigue failure load for a given number of cycles. The fatigue test program makes use of test coupons cut out of production blades to establish basic S/N curve shapes for fiber and matrix failures. Coupon testing included studying temperature/humidity preconditioning effects, as well as the effect of test temperature and in-service operation on the fatigue strength of unidirectional glass fiber composites. Full scale fatigue tests were conducted with root end and air foil sections. These tests included investigating effects of ballistic impact damage and long-term exposure to different climatic conditions. It is shown that the S/N curve shapes and scattering factors determined from coupon data can be applied to full scale specimens. Author (ESA)

N81-30486# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.

DISTURBANCE-FREE MEASUREMENTS OF THE TRACTION ON CABLE-HEADS, PARTICULARLY FOR LIGHT-CONDUCTING CABLES [EIN STOERUNGSUNEMPFINDLICHES VERFAHREN ZUR MESSUNG VON EINZUGSKRAEFTEN AM KABELKOPF, SPEZIELL VON LICHTLEITKABELN]

K. Gottwald and L. Giehmann Jan. 1980 39 p refs In GERMAN

(Rept-452-TER-40) Avail: NTIS HC A03/MF A01

A system allowing continuous and trouble-free transmission of instantaneous values of traction on the end of light-conducting fiberglass cables is described. Dirtproof, and shockproof structures are discussed. Four different possibilities for data transmission to a tape recorder or portable receiver are given. Field installation techniques are described. Dependence on pulling velocity of average traction and force variations and influence of cable casing, shape and material of conduits are commented on. Maximum cable length was 1000 m; maximum pulling force was 1000 N or 1500 N depending on kind of measurement head used; precision was 0.5% of values indicated.Author (ESA)

N81-30487# Oxford Univ. (England). Dept. of Engineering Science.

SECOND ORDER ANALYSIS OF ELASTIC FRAMES

G. Oliveto 1980 24 p refs Sponsored by CNR

(OUEL-1335/80) Avail: NTIS HC A02/MF A01

A second order theory for the analysis of elastic frames is presented. Its derivation by successive simplifications from the theory of finite deformations allows for the range of applicability with respect to the magnitude of admissible deformations and rotations to be clearly established. The general second order effects of axial force, finite deflections of nodes, members' end-shortening, and variation of the tangent stiffness matrix during loading, are established. The treatment is confined to the case of point-loading, but the extension to uniform loading may be made. A simple way of evaluating the bifurcation load is presented. Author (ESA)

N81-30488# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

THE PROBLEM OF STRESSES AROUND NONELLIPTICAL HOLES IN FINITE ORTHOTROPIC PLATES [HET SPANNINGSPROBLEEM IN ANISOTROPE PLATEN ROND GATEN MET EEN VORM AFWIJKEND VAN EEN ELLIPS]

T. Dejong Jun. 1980 66 p refs In DUTCH; ENGLISH summary

(VTH-LR-299) Avail: NTIS HC A04/MF A01

The basic equations for stress conditions in anisotropic plates and the exact solution for elliptical holes are given. Approximations based on the literature are used to determine disturbance functions for square and rectangular holes. The field of convergence of the disturbance function limiting the application outside of holes is formulated. Numerical elaboration is provided for three different shapes of holes (values of C equal 0.5; 0.75 and 1) in six different laminates of carbon fiber reinforced plastics and values of E equal 0.1, 0.111, and 0.125. Validity of formulas is limited to stresses occurring in X and Y axes plus a sliding stress in XY; material axes and coordinate axes must coincide. Comments emphasize simplicity of the formulas used and speed in obtaining results. Author (ESA)

N81-30489# Sydney Univ. (Australia). Civil Engineering Labs.

PLASTIC ROTATION OF COMPOSITE BEAMS

Peter Ansourian Sep. 1980 36 p refs Sponsored by the Alexander von Humboldt Foundation

(PB81-181026; R-371) Avail: NTIS HC A03/MF A01 CSCL 20K

The sagging rotation capacity of composite beams consisting of a concrete slab attached to a steel beam by a shear connection was studied. Tests are reported on four full-scale beams in the range of ductility parameter chi from 0.65 to 3.0. This parameter is an index of the degree of strain-hardening developed in the steel beam at collapse. Expressions are proposed for the minimum inelastic rotation and deflection available at collapse. Examples are given of the application of these expressions to design problems with continuous composite beams. It is shown that, with a minimum value of chi equal to 1.4, sufficient sagging rotation should be available to develop the conventional plastic design collapse load under the worst combinations of spans and loading. GRA

N81-30490# Sydney Univ. (Australia). Civil Engineering Labs.

ELASTIC BUCKLING OF BEAM-COLUMNS WITH UNEQUAL END MOMENTS

P. E. Cuk and N. S. Trahair (Sidney Univ., Australia) Nov. 1980 28 p refs

(PB81-181018; R-378) Avail: NTIS HC A03/MF A01 CSCL 20K

Accurate closed form solutions are available for the elastic flexural torsional buckling of isolated simply supported beam columns bent in single curvature by equal major axis end moments. Presently available extensions of these solutions for beam columns with unequal end moments are not accurate, and in some cases are very conservative. The accuracy of these approximations for beam columns with unequal end moments was investigated using a finite element method of computer analysis, and it was found that some approximate solutions are less than 65 percent of the accurate values. GRA

N81-30491# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

NONLINEAR VIBRATION OF LAYERED COMPOSITE PLATES INCLUDING TRANSVERSE SHEAR AND ROTATORY INERTIA

J. N. Reddy Mar. 1981 27 p refs Presented at 1981 ASME Vibration Conf., Hartford, 20-23 Sep. 1981 Sponsored by the Navy

(PB81-183642; VPI-E-81-6) Avail: NTIS HC A03/MF A01 CSCL 20K

The large amplitude free flexural vibration of layered composite plates, incorporating the effects of transverse shear and rotatory inertia, is studied using a finite element based on the displacement field of a shear deformable theory and the strain displacement equations of von Karman's plate theory. Free vibration of cross-ply and angle-ply rectangular plates is analyzed and natural frequencies are presented showing the effects of boundary conditions, side-to-thickness ratio (i.e., transverse shear), aspect ratio, orientation of layers and material anisotropy. GRA

42 GEOSCIENCES (GENERAL)

N81-30492# Danish Meteorological Inst., Copenhagen. Ionosphere Lab.

RIOMETER ABSORPTION DATA 1 JULY TO 30 SEPTEMBER 1979: GODHAVN, SDR. STROEMFJORD, NARSSARSSUAQ, DANEBORG, TJOERNES, NY-AALESUND, BJOERNOFYA AND RAMFJORD

Peter Stauning Dec. 1980 33 p refs

(IONLAB-R-58) Avail: NTIS HC A03/MF A01

Observations from eight observatories (four well inside the polar cap, three auroral zone, and one at very high auroral latitudes) are summarized. The riometers are part of the Ionlab polar riometer net. Geographic and geomagnetic coordinates, 100 km L-values and riometer frequencies at all 18 stations (December 1979) are given. Data recording, data quality and data processing are

described. Data diagrams for 1 July 1979 to 30 September 1979 are presented. Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N81-30493 Arizona State Univ., Tempe.
TACTUAL THEMATIC MAPPING: GRADUATED CIRCLE AND CHOROPLETH MAPS Ph.D. Thesis
Sona Karentz Andrews 1981 164 p
Avail: Univ. Microfilms Order No. 8117159

Tactual quantitative graphic displays and their ability to be used by the visually impaired are discussed. Graduated circle and choropleth types of maps were investigated. Symbol types, map design, and the psychophysical abilities of the map reader were analyzed. Dissert. Abstr.

N81-30494 Stanford Univ., Calif.
MODELS OF SURFACE-SUBSURFACE FLOW INTERACTION IN AN EPHEMERAL CHANNEL Ph.D. Thesis
David Lewis Freyberg 1981 228 p
Avail: Univ. Microfilms Order No. 8115789

A particularly distinguishing characteristic of ephemeral streamflow is the large role played by infiltration. Infiltration interacts in a complex way with channel flow to control the rate of advance of the wave front, the volume and distribution of infiltrated water, the rates of rise and fall of depth and flow hydrographs, and the peak depths and flowrates of flood flows. The simplified problem of flow in a rigid, prismatic channel of simple cross-sectional shape and straight alignment, underlain by a homogeneous, non-hysteretic porous medium, is considered. The problem is approached from two perspectives. First, infiltration is examined independently of its effect on surface flow. Then, a cross-sectional infiltration model is combined with a model of one dimensional open channel flow to study the dynamic interactions between surface and subsurface flows. Dissert. Abstr.

N81-30495 Michigan Univ., Ann Arbor.
OUTLET CHANNELS FOR THE POST-DULUTH LAKES IN THE UPPER PENINSULA OF MICHIGAN Ph.D. Thesis
Christopher William Drexler 1981 371 p
Avail: Univ. Microfilms Order No. 8116225

A portion of the glacial history of the Upper Peninsula is presented. Important results pertaining to the geologic history of the Post-Duluth interval are: the Post-Duluth interval began about 10,000 B.P. and ended about 9,600 B.P.; at the time Lake Sub-Duluth came into existence the Chippewa, Stanley and Hough Lakes were already in existence in the Lake Michigan and Lake Huron basins, Lake Minong was at that time, a small pro-glacial lake confined to the southeastern end of the Lake Superior basin; several lakes doubtfully included in the Post-Duluth interval and having shorelines developed at elevations below that of the Beaver Bay shoreline are now known to be Post-Duluth lakes. Two of these were named for their outlet sills; Glacial Lake Huron Mountain and Glacial Lake Shelter Bay. Dissert. Abstr.

N81-30496*# Phoenix Corp., McLean, Va.
SPACE BASED TOPOGRAPHIC MAPPING EXPERIMENT USING SEASAT SYNTHETIC APERTURE RADAR AND LANDSAT 3 RETURN BEAM VIDICON IMAGERY Final Report
Gerald L. Mader 20 Jul. 1981 35 p refs Prepared for JPL (Contract JPL-955998)
(NASA-CR-164675; JPL-9950582) Avail: NTIS HC A03/MF A01 CSCL 08B

A technique for producing topographic information is described which is based on same side/same time viewing using a dissimilar combination of radar imagery and photographic images. Common geographic areas viewed from similar space reference locations produce scene elevation displacements in opposite direction and proper use of this characteristic can yield the perspective information necessary for determination of base to height ratios. These base to height ratios can in turn be used to produce a topographic map. A test area covering the Harrisburg, Pennsylvania region was observed by synthetic aperture radar on the Seasat satellite and by return beam vidicon on by the LANDSAT - 3 satellite. The techniques developed for the scaling re-orientation and common registration of the two images are presented along with the topographic determination data. Topographic determination based exclusively on the images content is compared to the map information which is used as a performance calibration base. A.R.H.

N81-30497*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SAFETY EVALUATION METHODOLOGY FOR ADVANCED COAL EXTRACTION SYSTEMS
Wayne F. Zimmerman 15 Jul. 1981 107 p refs
(Contracts NAS7-100; DE-AI01-76ET-12548)
(NASA-CR-164703; JPL-Pub-81-54) Avail: NTIS HC A06/MF A01 CSCL 08I

Qualitative and quantitative evaluation methods for coal extraction systems were developed. The analysis examines the soundness of the design, whether or not the major hazards have been eliminated or reduced, and how the reduction would be accomplished. The quantitative methodology establishes the approximate impact of hazards on injury levels. The results are weighted by peculiar geological elements, specialized safety training, peculiar mine environmental aspects, and reductions in labor force. The outcome is compared with injury level requirements based on similar, safer industries to get a measure of the new system's success in reducing injuries. This approach provides a more detailed and comprehensive analysis of hazards and their effects than existing safety analyses. E.A.K.

N81-30498# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FOLLOWING OCEANOGRAPHIC PHENOMENA ON THE SOUTH COAST OF BRAZIL WITH REMOTE SENSING FROM ORBITAL DISTANCE [ACOMPANHAMENTO DE FENOMENOS OCEANOGRAFICOS DA COSTA SUL DO BRASIL POR SENSORIAMENTO REMOTO A DISTANCIA ORBITAL]
Emmanuel Gama deAlemida and Keiko Tanaka Jan. 1981 35 p refs In PORTUGUESE; ENGLISH summary
(INPE-1975-RPE/280) Copyright. Avail: NTIS HC A03/MF A01

Data obtained by the very high resolution radiometer (VHRR) on the NOAA-5 satellite show thermal contrast due to cold upwelled water which occurs along the coast of Rio de Janeiro State. Coastal station data, VHRR data, and a mathematical model based on Ekman's theory suggest a possible interpretation of mesoscale oceanic phenomena. It is concluded that: (1) when surface winds are from 22.5 deg (true), the thermal VHRR imagery indicates a cool surface plume that extends south of Cabo Frio; (2) when the wind direction increases to 67.5 deg (true) the cool plume changes to a SW direction; and (3) when the wind direction becomes than 135 deg (true), there is no cool water present near the coast. A.R.H.

N81-30499# General Electric Co., Lanham, Md. Space Div.
INTERACTIVE DIGITAL IMAGE PROCESSING FOR TERRAIN DATA EXTRACTION Interim Report, 18 Sep. 1979 - 17 Sep. 1980
Howard L. Heydt, Thomas F. Wescott, and Christopher J. Peterson Nov. 1980 181 p refs
(Contract DAAK70-79-C-0153)
(AD-A101321; ETL-0241) Avail: NTIS HC A09/MF A01 CSCL 09/2

Man-machine interactive digital image processing techniques were applied to the extraction of terrain analysis data from aerial imagery were investigated. Emphasis is given to the extraction of vegetation data elements from digitized panchromatic photograhy, with a small amount of attention given to thermal infrared and side-looking radar imagery. Vegetation data elements listed in the USAETL Terrain Analysis Procedural Guide for Vegetation are addressed in varying degrees of depth. Interactive digital techniques are developed for vegetation/land cover

boundary extraction, and for the extraction of several forest related data elements. The extraction techniques are developed using an interactive digital image analysis system-the General Elecric DIAL (Digital Image Analysis Laboratory). Results are compared in two cases to those achieved via existing manual analysis procedures. Author (GRA)

N81-30500# Georgia Univ., Athens. Dept. of Microbiology.
MICROBIOLOGICAL ASPECTS OF OIL PRODUCTION
W. R. Finnerty 1981 18 p refs
(Contract DE-AS09-80ER-10683)
(DOE/ER-10682/2) Avail: NTIS HC A02/MF A01

Reservoir microbiology is discussed. One oil release technique is an anaerobic fermentation within a reservoir. Biopolymers and polysaccharides have application in EOR. Hydrocolloids and surfactants of microbial origin are listed and their possible application mentioned. An example of the appapplication of bioengineering principles is bacterial desulfurization. DOE

N81-30501# D'Appolonia (E.) Consulting Engineers, Inc., Pittsburgh, Pa.
EVALUATION OF HOT DRY ROCK EXPLORATION TECHNIQUES IN THE ATLANTIC COASTAL PLAIN: A TEST SITE ON THE DELMARVA PENINSULA OF MARYLAND AND VIRGINIA
Apr. 1981 26 p refs
(Contract W-7405-eng-36)
(LA-8800-MS) Avail: NTIS HC A03/MF A01

The findings favor the HDR exploration program that is outlined for locating a deep test hole in an area with presumed HDR potential (higher than normal heat flow). Six potential sites for extracting HDR energy were identified within the Cris-Wall area. Each site is thought to have temperatures at the basement rock surface in excess of 75 C and to be at least 1 km away from the nearest fault. DOE

N81-30502# Rice Univ., Houston, Tex. Dept. of Geology.
METHODS DEVELOPMENT AND APPLICATIONS EVALUATIONS OF NURE AERIAL RECONNAISSANCE SURVEY DATA FOR URANIUM RESOURCE EVALUATION: BEEVILLE/BAY CITY AND CRYSTAL CITY QUADRANGLES, TEXAS Final Report
John A. S. Adams, Sam F. Harrill, and J. E. Oddo Apr. 1981 115 p refs Prepared for Bendix Field Engineering Corp., Grand Junction, Colo.
(Contracts DE-AC08-76NV-01183; DE-AC13-76GJ-01664)
(GJBX-69(81)) Avail: NTIS HC A06/MF A01

The NURE open-file reports on the aerial gamma spectrometric, hydrologic, and stream-sediment surveys of some 50,000 square kilometers of land area in south Texas were studied in regard to their utility in identifying regions of high or higher favorability for uranium deposits. Substantial agreement was found between the NURE aerial data and the ground and helicopter data as regards the general radioelement distributions in the stratigraphic units studied. The vehicle-mounted gamma-ray spectrometer used systematically gave some 30 percent higher thorium concentration estimates when compared with those from the NURE aerial data. The NURE aerial data are adequate in number to characterize the major stratigraphic units, but they may not be quantitative enough for detailed comparisons from one quadrangle to another, and the optimum sampling area for each formation is not known. DOE

N81-30503# New Mexico Inst. of Mining and Technology, Socorro.
DISPLACEMENT OF OIL BY CARBON DIOXIDE Final Report
F. M. Orr, Jr. and J. J. Taber May 1981 167 p refs
(Contract DE-AS21-78ET-12082)
(DOE/ET-12082/9) Avail: NTIS HC A08/MF A01

Factors influencing CO2 flooding are reported. Procedures are given for an experiment in which equilibrium phase compositions can be measured rapidly and continuously. Results of displacements of crude oil from slim tubes, cores and mixing cells are presented and interpreted in terms of detailed measurements of the phase behavior and fluid properties of the CO2 crude oil mixtures. Direct evidence is presented of the efficiency with which a CO2 rich liquid phase can extract hydrocarbons from a crude oil. A simple one dimensional process simulator for CO2 flooding applications is described. Simulation results are compared with experimental data from slim tube displacements. Comparison of displacement results, phase behavior measurements, and model calculations provides strong evidence that the high displacement efficiency which can be obtained when pressure is high enough and viscous fingering is controlled is the result of efficient extraction of a broad range of hydrocarbons by a dense CO2 rich phase which is a liquid if the temperature is below about 50 C (130 F). DOE

N81-30504# Gulf Universities Research Consortium, Bellaire, Tex.
SURVEY OF ACTIVITY IN THE AREA OF INSTRUMENTATION FOR RESERVOIR DESCRIPTION FOR ENHANCED OIL RECOVERY Final Report
May 1981 77 p refs
(Contracts DE-AC01-76ET-10145; EX-76-C-01-2025)
(DOE/ET-10145/64; GURC-173) Avail: NTIS HC A05/MF A01

The state-of-the-art and progress in the types of instrumentation applied to reservoir description are reviewed. Sources of reservoir information are cores, wire line logs and well tests. The new techniques involve geophysics, geochemistry and tracer testing for oil recovery, the instrumentation must be capable to measure smaller scale effects with great accuracy. Computer simulation utilizing geological detail project the behavior of the EOR processes selected for the reservoir. DOE

N81-30505# Los Alamos Scientific Lab., N. Mex.
SEASAT SATELLITE INVESTIGATION OF THE STRUCTURE OF WESTERN NEBRASKA AND ITS APPLICATION TO THE EVALUATION OF GEOTHERMAL RESOURCES
J. Stix 1981 20 p refs Presented at the Intern. Symp. of Remote Sensing of Environ., Ann Arbor, Mich., 11-15 May 1981
(Contract W-7405-eng-36)
(LA-UR-81-1454; CONF-810557-1) Avail: NTIS HC A02/MF A01

Seasat synthetic aperture radar (SAR) satellite imagery was used to interpret the structural framework and the geothermal potential of an area in western Nebraska. Lineaments were mapped from the imagery and then compared to known structure. It was found that Seasat does record surface manifestations of subtle basement structures, particularly faulting. Four areas with geothermal potential were delineated using Seasat and other data. It is concluded that Seasat imagery is a useful reconnaissance exploration tool in the interpretation of regional structure within areas of little topographic relief. DOE

N81-30506# Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
THE 1979 CEC REMOTE SENSING CAMPAIGN
A. vanderMeulen and C. Bartels 1980 40 p refs Presented at Turbigo, Italy, 8-11 Sep. 1979
(Memo-FL/1980/12/20) Avail: NTIS HC A03/MF A01

Surveys carried out to determine SO2 and NO2 vertical gas burdens and SO2, NOX and O3 ground concentration profiles are described. The plume dispersion capacity of the Ticino valley was sought. Vertical gas burden profile measurements made as a function of decreasing measurement position/source distance enabled both lateral and vertical dispersion coefficients to be obtained together with the corresponding atmospheric stability classes. The effective emission height was established as well as probable mixing height from the quotient of the integrated vertical gas burden and ground concentration profiles (as a function of distance). Detailed wind data as a function of height is emphasized in particular, when evaluating the effects of a changeover from high to lower sulfur oil on air quality.
Author (ESA)

N81-30507# Department of Agriculture, Washington, D.C. Statistical Research Div.
CROP AREA ESTIMATION USING GROUND-GATHERED AND SAMPLED LANDSAT DATA
James Weldon Mergerson May 1981 23 p refs
(PB81-192783; AGESS-810408) Avail: NTIS HC A02/MF A01 CSCL 02C

A comparative study in which a procedure using ground gathered data and classified LANDSAT data for estimating crop area were compared to procedures using ground gathered data and sampled LANDSAT data is described. Data from parts of Iowa and Missouri were used. Unitemporal data were used in Iowa and multitemporal data were used in Missouri. Results indicate that some sampling schemes can be used without any significant difference in the crop area estimates, but with a large reduction in cost for corn, soybeans, and winter wheat. GRA

N81-30508# Georgia Inst. of Tech., Atlanta. Applied Sciences Lab.

AGRICULTURAL WATER DEMAND PREDICTION USING REMOTE SENSING TECHNOLOGY FOR GEORGIA RESOURCE MANAGEMENT

John R. Jensen and Donald L. Chery Dec. 1980 57 p refs Sponsored by Dept. of Interior Prepared in cooperation with Georgia Univ., Athens

(PB81-184137; W81-02428; ERC-07-80; OWRT-A-083-GA(1)) Avail: NTIS HC A04/MF A01 CSCL 02C

A method to assess the amount of water pumped from aquifers or the effect of intensive agriculture on watershed water balance (WWB) is discussed. Certain measurements are needed to model WWB. The major flow components are (1) rainfall input, and (2) out flows of evapotranspiration (ET) and surface and subsurface discharge. ET is determined by careful selection and analysis of LANDSAT digital data to determine an agriculture region's land cover; ET was used in a hydrologic water balance model. Digital image processing of LANDSAT-3 data discriminated major field crops and forests in Tift County, Georgia, for a water use assessment. GRA

N81-30509# Minnesota Univ., Minneapolis. Remote Sensing Lab.

SATELLITE MONITORING OF SNOW EXTENT AND CONDITION IN AGRICULTURAL, TRANSITIONAL, AND FORESTED LAND COVER AREAS Final Report

T. M. Lillesand, D. E. Meisner, A. L. Downs, and R. L. Deuell Dec. 1980 38 p refs

(Grant DOC/NA80AA-D-0019)

(PB81-188625; NOAA-81021104; RSL-RR-80-6) Avail: NTIS HC A03/MF A01 CSCL 08L

GOES and TIROS/NOAA-6 satellite data were evaluated visually and digitally to assess their potential for aiding the process of state wide snow extent mapping in Minnesota. This state contains a geographic continuum spanning from a large open agricultural area, through a partially forested transitional zone, to a heavily forested area. The ability to discriminate snow extent statewide was found to be influenced by the state of sensing and the cover types involved. GRA

N81-30510# Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

AREAL PREDICTION OF WATER AND SOLUTE FLUX IN THE UNSATURATED ZONE Final Report

Arthur W. Warrick and Azizolah Amoozegar-Fard Apr. 1981 88 p refs

(Grant EPA-R-804751)

(PB81-191124; EPA-600/2-81-058) Avail: NTIS HC A05/MF A01 CSCL 08M

The areal distribution of water and solutes over land was studied. The simulations of salt and water movement were done by the crude Monte Carlo technique. Drainage calculations were made by utilizing a scaled form of the nonlinear moisture flow equation. Salt distributions were considered for cases of equal irrigation amounts, but with intake rates varying over space. It is concluded that the true average distribution is much more dispersed with more salts reaching deep depths and also more salts near the surface. Similarly, the mass emissions of salts averaged over a field appear earlier than would be calculated by using mean velocities. GRA

N81-30511# Department of Agriculture, Washington, D.C. Statistical Reseach Div.

AGRISTARS (AGRICULTURE AND RESOURCES INVENTORY SURVEYS THROUGH AEROSPACE REMOTE SENSING) DC/LC (DOMESTIC CROPS AND LAND ROVER) PROJECT SUMMARY CROP AREA ESTIMATES FOR KANSAS AND IOWA, 1980

David D. Kleweno and Charles E. Miller Mar. 1981 20 p refs

(PB81-196909; AGESS-810414) Avail: NTIS HC A02/MF A01 CSCL 02B

The major crop area estimation element of the 1980 AgRISTARS DC/LC project as implemented by the Economics and Statistics Service is described. Data from NASA Earth resources monitoring satellites, LANDSAT II and III, were used in conjunction with conventionally gathered ground data to provide 1980 crop area estimates of harvested winter wheat in Kansas and planted soybeans and corn in Iowa. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N81-30512 International Institute for Applied Systems Analysis, Laxenburg (Austria).

THE IIASA SET OF ENERGY MODELS: ITS DESIGN AND APPLICATION

Paul S. Basile, M. Agnew, A. Holzl, Yu. Kononov, A. Papin, H.-H. Rogner, and L. Schrattenholzer Dec. 1980 67 p refs (IIASA-RR-80-31) Avail: Issuing Activity

The models studied include an accounting framework type energy demand model, a dynamic linear programming energy supply and conversion system model, an input-output model, a macroeconomic model, and an oil trade gaming model. They are incorporated in an integrated set for long-term, global analyses. This set makes use of a highly iterative process for energy scenario projections and analyses. Each model is quite simple and straightforward in structure; a great deal of human judgement is necessary in applying the set. The models are applied to study two alternative energy scenarios for a coming fifty year period. Examples are presented revealing the wealth of information that can be obtained from multimodel techniques. Details are given for several models (equations employed, assumptions made, data used). Author (ESA)

N81-30513*# United Technologies Corp., South Windsor, Conn. Power Systems Div.

ADVANCED TECHNOLOGY LIGHTWEIGHT FUEL CELL PROGRAM Final Report, 31 Aug. 1979 - 28 Feb. 1981

R. E. Martin 18 Aug. 1981 95 p refs

(Contract NAS3-21293)

(NASA-CR-165417; FCR-3045) Avail: NTIS HC A05/MF A01 CSCL 10A

The potential of the alkaline electrolyte fuel cell as the power source in a multi hundred kilowatt orbital energy storage system was studied. The total system weight of an electrolysis cell energy storage system was determined. The tests demonstrated: (1) the performance stability of a platinum on carbon anode catalyst configuration after 5000 hours of testing has no loss in performance; (2) capability of the alkaline fuel cell to operate to a cyclical load profile; (3) suitability of a lightweight graphite electrolyte reservoir plate for use in the alkaline fuel cell; (4) long life potential of a hybrid polysulfone cell edge frame construction; and (5) long term stability of a fiber reinforced potassium titanate matrix structure. The power section tested operates with passive water removal eliminating the requirement for a dynamic hydrogen pump water separator thereby allowing a powerplant design with reduced weight, lower parasite power, and a potential for high reliability and extended endurance. It is concluded that two perovskites are unsuitable for use as a catalyst or as a catalyst support at the cathode of an alkaline fuel cell. E.A.K.

N81-30514*# Santa Barbara Research Center, Goleta, Calif.
DEVELOPMENT OF METHODS OF PRODUCING LARGE AREAS OF SILICON SHEET BY THE SLICING OF SILICON INGOTS USING INSIDE DIAMETER (I.D.) SAWS Final Report, May 1979 - Apr. 1980
Peter Aharonyan Apr. 1980 27 p Sponsored in part by NASA and DOE
(Contract JPL-955131)
(NASA-CR-164690; DOE/JPL-955131-81/2; JPL-9950567; ORD-78/DRL-SE-5) Avail: NTIS HC A03/MF A01 CSCL 04B

Modifications to a 16 inch STC automated saw included: a programmable feed system; a crystal rotating system; and a STC dynatrack blade boring and control system. By controlling the plating operation and by grinding the cutting edge, 16 inch I.D. blades were produced with a cutting edge thickness of .22 mm. Crystal rotation mechanism was used to slice 100 mm diameter crystals with a 16 inch blade down to a thickness of .20 mm. Cutting rates with crystal rotation were generally slower than with standard plunge I.D. slicing techniques. Using programmed feeds and programmed rotation, maximum cutting rates were from 0.3 to 1.0 inches per minute. T.M.

N81-30515*# Solarex Corp., Rockville, Md.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Quarterly Report, 1 Mar. - 31 May 1981
31 May 1981 52 p refs Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-955902)
(NASA-CR-164673; DOE/JPL-955902-81/2; JPL-9950572; QR-2) Avail: NTIS HC A04/MF A01 CSCL 10A

The purpose of this program is to demonstrate the technical readiness of a cost effective process sequence that has the potential for the production of flat plate photovoltaic modules which met the price goal in 1986 of $.70 or less per watt peak. Program efforts included: preliminary design review, preliminary cell fabrication using the proposed process sequence, verification of sandblasting back cleanup, study of resist parameters, evaluation of pull strength of the proposed metallization, measurement of contact resistance of Electroless Ni contacts, optimization of process parameter, design of the MEPSDU module, identification and testing of insulator tapes, development of a lamination process sequence, identification, discussions, demonstrations and visits with candidate equipment vendors, evaluation of proposals for tabbing and stringing machine. Author

N81-30516*# MB Associates, San Ramon, Calif.
PROCESS DEVELOPMENT FOR AUTOMATED SOLAR CELL AND MODULE PRODUCTION. TASK 4: AUTOMATED ARRAY ASSEMBLY Quarterly Report
John J. Hagerty 15 Jul. 1981 42 p
(Contract JPL-955699)
(NASA-CR-164682; DOE/JPL-955699-81/04; JPL-9950574; QR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

Progress in the development of automated solar cell and module production is reported. The unimate robot is programmed for the final 35 cell pattern to be used in the fabrication of the deliverable modules. The mechanical construction of the automated lamination station and final assembly station phases are completed and the first operational testing is underway. The final controlling program is written and optimized. The glass reinforced concrete (GRC) panels to be used for testing and deliverables are in production. Test routines are grouped together and defined to produce the final control program. E.A.K.

N81-30517*# Texas Research and Engineering Inst., Inc., Groves.
SILICON PRODUCTION PROCESS EVALUATIONS Quarterly Technical Progress Report, 18 May - 31 Jul. 1981
Aug. 1981 14 p Sponsored in part by NASA and DOE
(Contract JPL-956045)
(NASA-CR-164773; DOE/JPL-956045-81/1; JPL-9950575; QTPR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The chemical engineering analysis of the preliminary process design of a process for producing solar cell grade silicon from dichlorosilane is presented. A plant to produce 1,000 MT/yr of silicon is analyzed. Progress and status for the plant design are reported for the primary activities of base case conditions (60 percent), reaction chemistry (50 percent), process flow diagram (35 percent), energy balance (10 percent), property data (10 percent) and equipment design (5 percent). J.D.H.

N81-30518*# Kayex Corp., Rochester, N. Y.
DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW COST 150 KG SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Quarterly Progress Report, 1 Jan. - 31 Mar. 1981
31 Mar. 1981 20 p refs Sponsored in part by DOE Prepared for JPL
(Contracts JPL-955733; JPL-954888)
(NASA-CR-164674; DOE/JPL-955733-81/2; JPL-9950576; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

The modified CG2000 crystal grower construction, installation, and machine check-out was completed. The process development check-out proceeded with several dry runs and one growth run. Several machine calibrations and functional problems were discovered and corrected. Several exhaust gas analysis system alternatives were evaluated and an integrated system approved and ordered. A contract presentation was made at the Project Integration Meeting at JPL, including cost-projections using contract projected throughput and machine parameters. Several growth runs on a development CG200 RC grower show that complete neck, crown, and body automated growth can be achieved with only one operator intput.Work continued for melt level, melt temperature, and diameter sensor development. Author

N81-30519*# Union Carbide Corp., Oak Ridge, Tenn.
LOW COST SOLAR ARAY PROJECT: EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Quarterly Progress Report, Apr. - Jun. 1981
Jun. 1981 71 p Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-954334)
(NASA-CR-164680; DOE/JPL-954334-19; JPL-9950577) Avail: NTIS HC A04/MF A01 CSCL 10A

This phase consists of the engineering design, fabrication, assembly, operation, economic analysis, and process support R&D for an Experimental Process System Development Unit (EPSDU). The mechanical bid package was issued and the bid responses are under evaluation. Similarly, the electrical bid package was issued, however, responses are not yet due. The majority of all equipment is on order or has been received at the EPSDU site. The pyrolysis/consolidation process design package was issued. Preparation of process and instrumentation diagram for the free-space reactor was started. In the area of melting/consolidation, Kayex successfully melted chunk silicon and have produced silicon shot. The free-space reactor powder was successfully transported pneumatically from a storage bin to the auger feeder twenty-five feet up and was melted. The fluid-bed PDU has successfully operated at silane feed concentrations up to 21%. The writing of the operating manual has started. Overall, the design phase is nearing completion. Author

N81-30520*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
SILICON SOLAR CELL PROCESS DEVELOPMENT, FABRICATION, AND ANALYSIS Quarterly Report, 1 Jan. - 31 Mar. 1981
H. I. Yoo, P. A. Iles, and D. C. Leung 31 Mar. 1981 91 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955089)
(NASA-CR-164676; DOE/JPL-955089-81/11; JPL-9950580; QR-9) Avail: NTIS HC A05/MF A01 CSCL 10A

Two large cast ingots were evaluated. Solar cell performance versus substrate position within the ingots was obtained and the results are presented. Dendritic web samples were analyzed in terms of structural defects, and efforts were made to correlate the data with the performance of solar cells made from the webs. A.R.H.

N81-30521*# Battelle Columbus Labs., Ohio.
EVALUATION OF SELECTED CHEMICAL PROCESSES FOR

PRODUCTION OF LOW-COST SILICON, PHASE 3 Final Report, 10 Jul. 1978 - 31 Jan. 1981
J. M. Blocher, Jr., M. F. Browning, and D. A. Seifert 31 Mar. 1981 105 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-954339)
(NASA-CR-164677; DOE/JPL-954339-81/21; JPL-9950581) Avail: NTIS HC A06/MF A01 CSCL 10A

A Process Development Unit (PDU), which consisted of the four major units of the process, was designed, installed, and experimentally operated. The PDU was sized to 50MT/Yr. The deposition took place in a fluidized bed reactor. As a consequences of the experiments, improvements in the design an operation of these units were undertaken and their experimental limitations were patially established. A parallel program of experimental work demonstrated that Zinc can be vaporized for introduction into the fluidized bed reactor, by direct induction-coupled r.f. energy. Residual zinc in the product can be removed by heat treatment below the melting point of silicon. Current efficiencies of 94 percent and above, and power efficiencies around 40 percent are achievable in the laboratory-scale electrolysis of ZnCl2. T.M.

N81-30522*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREPARATION AND CHARACTERIZATION OF ELECTRODES FOR THE NASA REDOX STORAGE SYSTEM
Margaret A. Reid, Randall F. Gahn, Jerri S. Ling, and JoAnn Charleston Sep. 1980 17 p refs Prepared for Electrochem. Soc. Meeting, Hollywood, Fla., 5-10 Sep. 1980
(Contract DE-AI04-80AL-12726)
(NASA-TM-82702; DOE/NASA/12726-13; E-739) Avail: NTIS HC A02/MF A01 CSCL 10C

Electrodes for the Redox energy storage system based on iron and chromium chloride reactants is discussed. The physical properties of several lots of felt were determined. Procedures were developed for evaluating electrode performance in lab scale cells. Experimental procedures for evaluating electrodes by cyclic voltammetry are described which minimize the IR losses due to the high internal resistance in the felt (distributed resistance). Methods to prepare electrodes which reduced the coevolution of hydrogen at the chromium electrode and eleminate the drop in voltage on discharge occasionally seen with previous electrodes were discussed. Single cells of 0.3329 ft area with improved membranes and electrodes are operating at over 80% voltage efficiency and coulombic efficiencies of over 98% at current densities of 16 to 20 amp % ft. E.A.K.

N81-30523*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
DESIGN DATA PACKAGE AND OPERATING PROCEDURES FOR MSFC SOLAR SIMULATOR TEST FACILITY
Jun. 1981 174 p refs Sponsored in part by DOE
(Contract DEN8-6)
(NASA-CR-161825; WYLE-TR-531-48) Avail: NTIS HC A08/MF A01 CSCL 10A

Design and operational data for the solar simulator test facility are reviewed. The primary goal of the facility is to evaluate the performance capacibility and worst case failure modes of collectors, which utilize either air or liquid transport media. The facility simulates environmental parameters such as solar radiation intensity, solar spectrum, collimation, uniformity, and solar attitude. The facility also simulates wind conditions of velocity and direction, solar system conditions imposed on the collector, collector fluid inlet temperature, and geometric factors of collector tilt and azimuth angles. Testing the simulator provides collector efficiency data, collector time constant, incident angle modifier data, and stagnation temperature values. E.A.K.

N81-30524*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SYSGEN USER PACKAGE
C. R. Carlson 15 Mar. 1981 119 p refs
(Contracts NAS7-100; DE-AT04-81AL-16228)
(NASA-CR-164706; JPL-Pub-81-47; DOE/JPL-1060-47) Avail: NTIS HC A06/MF A01 CSCL 10B

The user documentation of the SYSGEN model and its links with other simulations is described. The SYSGEN is a production costing and reliability model of electric utility systems. Hydroelectric, storage, and time dependent generating units are modeled in addition to conventional generating plants. Input variables, modeling options, output variables, and reports formats are explained. SYSGEN also can be run interactively by using a program called FEPS (Front End Program for SYSGEN). A format for SYSGEN input variables which is designed for use with FEPS is presented. E.A.K.

N81-30525*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PARABOLIC DISH SOLAR THERMAL POWER ANNUAL PROGRAM REVIEW PROCEEDINGS
Herb J. Holbeck 1 May 1981 277 p refs Proceedings of conf. held in Pasadena, Calif., 13-15 Jan. 1981
(Contracts NAS7-100; DE-AT04-81AL-16228)
(NASA-CR-164696; JPL-Pub-81-44; DOE/JPL-1060-46; JPL-5105-83) Avail: NTIS HC A13/MF A01 CSCL 10A

The development and testing of concentrators, receivers, and power conversion units are reported. System design and development for engineering experiments are described. Economic analysis and market assessments for advanced development activities are discussed. Technology development issues and application/user needs are highlighted. For individual titles, see N81-30526 through N81-30557.

N81-30526*# Ford Aerospace and Communications Corp., Newport Beach, Calif.
THE SCSE ORGANIC RANKINE ENGINE
Frank P. Boda *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 5-9 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The engine is the heart of a Power Conversion Subsystem (PCS) located at the focal point of a sun-tracking parabolic dish concentrator. The ORC engine employs a single-stage axial-flow turbine driving a high speed alternator to produce up to 25 kW electrical output at the focus of each dish. The organic working fluid is toluene, circulating in a closed-loop system at temperatures up to 400 C (750 F). Design parameters, system description, predicted performance and program status are described. T.M.

N81-30527*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JAY CARTER ENTERPRISES, INCORPORATED STEAM ENGINE
In its Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 11-15 refs (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The Small Community Solar Thermal Power Experiment (SCSE) selected an organic rankine cycle (ORC) engine driving a high speed permanent magnet alternator (PMA) as the baseline power conversion subsystem (PCS) design. The back-up conceptual PCS design is a steam engine driving an induction alternator delivering power directly to the grid. The development of the automotive reciprocating simple rankine cycle steam engine and how an engine of similar design might be incorporated into the SCSE is discussed. A description of the third generation automotive engine is included along with some preliminary test data. Tests were conducted with the third generation engine driving an induction alternator delivering power directly to the grid. The purpose of these tests is to further verify the effects of expander inlet temperature, input thermal power level, expansion ratio, and other parameters affecting engine performance to aid in the development of an SCSE PCS. T.M.

N81-30528*# Foster-Miller Associates, Inc., Waltham, Mass.
STEAM ENGINE RESEARCH FOR SOLAR PARABOLIC DISH
Roger L. Demler *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Proc. 1 May 1981 p 17-22 refs (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The parabolic dish solar concentrator provides an opportunity to generate high grade energy in a modular system. Most of the capital is projected to be in the dish and its installation. Assurance of a high production demand of a standard dish could lead to dramatic cost reductions. High production volume in

turn depends upon maximum application flexibility by providing energy output options, e.g., heat, electricity, chemicals and combinations thereof. Subsets of these options include energy storage and combustion assist. A steam engine design and experimental program is described which investigate the efficiency potential of a small 25 kW compound reheat cycle piston engine. An engine efficiency of 35 percent is estimated for a 700 C steam temperature from the solar receiver. T.M.

N81-30529*# Garrett Turbine Engine Co., Phoenix, Ariz.
SOLAR BRAYTON ENGINE/ALTERNATOR SET
L. Six and R. Elkins *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 23-35 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Work on the Mod 0 solar Brayton engine/alternator set is redirected to utilize solarized components of the automotive advanced gas turbine (AGT). The new configuration is referred to as the Mod I. Commercialization of solar Brayton engines thus should be enhanced not only by relating the design to an engine expected to reach the high quantity, low cost production rates associated with the automotive market, but also by the potential the AGT components provide for growth of efficiency and power rating. This growth would be achieved through use of ceramics in later versions making operation possible at temperatures up to 2500 F. The longer program duration and higher cost of the Mod I is considered. T.M.

N81-30530*# United Sterling, Inc. Alexandria, Va. Concept Analysis Dept.
FIRST PHASE TESTING OF SOLAR THERMAL ENGINE AT UNITED STIRLING
Worth Percival and Hans-Goeran Nelving *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 37-44 refs (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The objective of the program is to demonstrate that the Stirling engine is a practical efficient and reliable energy converter when integrated with a parabolic dish concentrator, and that it has the potential of being cost competitive with fossil fueled electric generating systems of today. The engine, with its receiver (solar heat exchanger), alternator and control system, is described. T.M.

N81-30531*# Fairchild Stratos Corp., Manhattan Beach, Calif.
NON-HEAT PIPE RECEIVER/P-40 STIRLING ENGINE
Richard A. Haglund *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 47-50 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The technology for a full-up hybrid dish-Stirling Solar Thermal Power system is discussed. Overall solar-to-electric efficiency for the dish-Stirling system demonstration is approximately 30%. Hybrid operation is provided by fossil fuel combustion augmentation, which enables the Stirling engine to operate continuously at constant speed and power, regardless of insolation level, thus providing the capability to operate on cloudy days and at night. T.M.

N81-30532*# General Electric Co., Evendale, Ohio. Advanced Energy Programs Dept.
HEAT PIPE SOLAR RECEIVER WITH THERMAL ENERGY STORAGE
W. F. Zimmerman *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 51-56 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

An HPSR Stirling engine generator system featuring latent heat thermal energy storge, excellent thermal stability and self regulating, effective thermal transport at low system delta T is described. The system was supported by component technology testing of heat pipes and of thermal storage and energy transport models which define the expected performance of the system. Preliminary and detailed design efforts were completed and manufacturing of HPSR components has begun. T.M.

N81-30533*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF AN 85-kW (THERMAL) AIR BRAYTON RECEIVER
M. Greevan (AiResearch Manufacturing Co., Torrance, Calif.) and William Owen *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 57-65 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The results of the program from its inception through December 1980 are presented. The design requirements, concept, and significant analysis upon which the receiver is based are described. The fabrication processes that have been utilized in the construction of the prototype receivers at the test station are summarized. The test and evaluation phase at the Parabolic Dish Test Site are described. T.M.

N81-30534*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF AN 85-kW (THERMAL) STEAM RANKINE SOLAR RECEIVER
Clifford C. Wright (AiResearch Manufacturing Co., Torrance, Calif.) and Herman Bank *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 67-74 refs (For primary document see N81-30525 21-44)
Avail: NTIS HC A14/MF A01 CSCL 10A

The receiver is a once-through monotube boiler designed for steam/electric and process steam applications at pressures up to 17.24 MPa (2500 psia) and temperatures up to 704 C (1300 F). The unit is 76.2 cm (30.0 in.) in diameter and 95.8 cm (37.7 in.) in length; it weighs 220 kg (485 lb). Its heat transfer surface, which is 45.7 cm (18 in.) in diameter by 57 cm (22.4 in.) long, is an Inconel 625, cylindrical, tube-coil assembly composed of primary and reheat sections. A test unit was successfully operated at up to 6.9 MPa (1000 psia) and 704 C (1300 F) with solar input from a 11-m-dia parabolic dish concentrator. T.M.

N81-30535*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
ORGANIC RANKINE CYCLE RECEIVER DEVELOPMENT
Harold J. Haskins *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 75-79 ref (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The selected receiver concept is a direct-heated, once-through, monotube boiler operated at supercritical pressure. The cavity is formed by a cylindrical copper shell and backwall, with stainless steel tubing brazed to the outside surface. This core is surrounded by lightweight refractory insulation, load-bearing struts, and an outer case. The aperture plate is made of copper to provide long life by conduction and reradiation of heat away from the aperture lip. The receiver thermal efficiency is estimated to be 97 percent at rated conditions (energy transferred to toluene divided by energy incident on aperture opening). Development of the core manufacturing and corrosion protection methods is complete. T.M.

N81-30536*# General Electric Co., Philadelphia, Pa.
SOLAR THERMAL PARABOLIC DISH ENERGY APPLICATIONS
Walter Pijawka *In* JPL Parabolic Dish Solar Thermal Ann. Program Rev. Proc. 1 May 1981 p 87-106 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Vu-graphs are presented that show that applications are a viable distributed renewable power generation option. Quality energy can be produced in the form of electricity and high temperature heat. Modular systems are described that can be distributed to new or existing plants and that are mass producible with the associated economies of production. T.M.

N81-30537*# Ford Aerospace and Communications Corp., Newport Beach, Calif.
STATUS OF THE CURRENT PARABOLIC DISH TECHNOLOGY
Calhoun Sumrall *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 107-115 (For primary

document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Vu-graphs are presented that show that point focus distributed receiver distributed generation systems are cost competitive with current utilities. System cost caveats and typical power module costs are described. Major problems inhibiting commercialization of the parabolic dish technology were reviewed. T.M.

N81-30538*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERIZATION OF POINT FOCUSING TEST BED CONCENTRATORS AT JPL
Donald J. Starkey *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 135-142 Sponsored in part by DOE (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The characterization data were measured using both a flux mapper and a cold water calorimeter. The flux mapper uses a Kendall Radiometer as the sensing device. It is mounted on an x, y, z motor-driven positioning mechanism that allows the sensor to take an x-y flux raster at several Z planes in the vicinity of the concentrators nominal focal plane. Various concepts were tried to protect the concentrator structure from being damaged by the Sun's energy during sun acquisition and deacquisition. A description of both the passive and active protective systems is presented. T.M.

N81-30539*# General Electric Co., Philadelphia, Pa.
GENERAL ELECTRIC POINT FOCUS SOLAR CONCENTRATOR STATUS
J. Zimmerman *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 143-147 ref (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The concentrator design approach evolved by a systemmatic process of examining the operating requirements particular to the solar application, minimizing material content through detail structural design and structurally efficient subsystem features, and utilizing materials and processes compatible with high volume production techniques. The design approach, the present concentrator configuration and the status of the hardware development are described. T.M.

N81-30540*# Acurex Corp., Mountain View, Calif.
LOW COST CONCENTRATOR
Roger J. Bedard, Jr and Peter Overly *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 149-153 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The key to concentrator cost effectiveness is the proper design of the reflector surface panels. The low cost concentrator reflective surface design is based on use of a thin, backsilvered mirror glass reflector bonded to a molded structural plastic substrate. This combination of reflective panel material offers excellent optical performance at low cost. The design approach, rationale for the selected configuration, and the development status are described. Reflective panel development and demonstration results are also presented. T.M.

N81-30541*# Acurex Corp., Mountain View, Calif.
ADVANCED CONCENTRATOR PANELS
David M. Bell and Roger J. Bedard, Jr. *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 155-159 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The prototype fabrication of a lightweight, high-quality cellular glass substrate reflective panel for use in an advanced point-focusing solar concentrator was completed. The reflective panel is a gore shaped segment of an 11-m paraboloidal dish. The overall concentrator design and the design of the reflective panels are described. prototype-specific panel design modifications are discussed and the fabrication approach and procedure outlined. T.M.

N81-30542*# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT AND TESTING OF THE SHENANDOAH COLLECTOR
George S. Kinoshita *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 161-170 Sponsored by DOE (For primary document see N81-30525 21-44) (SAND-81-0028A) Avail: NTIS HC A13/MF A01 CSCL 10A

The test and development of the 7-meter Shenandoah parabolic dish collector incorporating an FEK-244 film reflective surface and cavity receiver are described. Four prototypes tested in the midtemperature Solar System Test Facility indicate, with changes incorporated from these development tests, that the improvements should lead to predicted performance levels in the production collectors. Author

N81-30543*# Power Kinetics, Inc., Troy, N.Y.
FRESNEL CONCENTRATING COLLECTOR
William Rogers, David Borton, Mark Rice, and Robert Rogers *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 171-178 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

An advanced point focusing solar technology demonstrated potential for near term commercialization as a renewable energy technology. The design features combine to produce a highly efficient, low cost, safe, adaptable, durable system which is simple to manufacture, install and maintain. S.F.

N81-30544*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SMALL COMMUNITY SOLAR THERMAL POWER EXPERIMENT
Taras Kiceniuk *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 187-189 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Contractors were asked to develop a preferred system concept, to perform sensitivity analyses, and to outline recommended approaches for the follow-on design program of a one-megawatt solar thermal demonstration plant. The systems recommended by the contractors in each of the categories were: (1) McDonnell-Douglas Astronautics Company: Central tower with field of south-facing heliostats; (2) General Electric Company: Field of parabolic dishes with steam piped to a central turbine-generator unit; and (3) Ford Aerospace and Communications Corporation: Field of parabolic dishes with a Stirling cycle engine/generator unit at the focus of each dish. A description of each of the proposed experimental plants is given. S.F.

N81-30545*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
DEVELOPMENT OF THE SMALL COMMUNITY SOLAR POWER SYSTEM
Robert H. Babbe *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 191-196 (For primary document see N81-30525 21-44)
(Contract JPL-955637)
Avail: NTIS HC A13/MF A01 CSCL 10A

The status of the Small Community Solar Thermal Power Experiment is presented. Activities on the Phase 2 single/module development effort are presented, together with plans for the Phase 3 1 MWe demonstration plant. A description of the various subsystems and components is given with emphasis on the unmanned microprocessor based plant control subsystem. Latest performance figures are given for the 1 MWe plant, based on 56 power modules, each consisting of a 12m low cost concentrator, a cavity receiver, a Rankine power conversion subsystem and a ground mounted solid-state rectifier. Overall plant efficiency at rated conditions is 15.8 percent. Advanced glass concentrator designs yield 20 percent overall efficiencies. S.F.

N81-30546*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SITE PARTICIPATION IN THE SMALL COMMUNITY EXPERIMENT
Herb J. Holbeck and Merrilee Fellows *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 197-204 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The Small Community Solar Thermal Experiment, planned

to test a small, developmental solar thermal power plant in a small community application, is assessed. The baseline plan is to install a field of parabolic dishes with distributed generation to provide 1 MWe of experimental power. Participation by the site proposer is an integral element of the experiment: the proposer will provide a ten-acre site, a connection to the electrical distributional system servin the small community, and various services. In addition to the primary participant, site study efforts may be pursued at as many as five alternative sites. S.F.

N81-30547*# Los Alamos Scientific Lab., N. Mex.
DEFINITIVE DESIGN OF THE SOLAR TOTAL ENERGY LARGE-SCALE EXPERIMENT AT SHENANDOAH, GEORGIA
R. W. Hunke and J. A. Leonard *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 205-208 Sponsored by DOE (For primary document see N81-30525 21-44)
(SAND-81-0029A) Avail: NTIS HC A13/MF A01 CSCL 10A

Construction of a Solar Total Energy Large Scale Experiment at Shenandoah, Georgia, is described. The Solar Total Energy System (STES) is designed with capacity to supply electricity and thermal energy to a knitwear plant at the Shenandoah site. The system will provide 400 kilowatts electrical and 3.5 megawatts thermal energy. The STES is a cascaded total energy system configuration. It uses parabolic disch collectors and a steam turbine-generator. The electrical system will be grid connected to the Georgia Power Company system. S.F.

N81-30548*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE JPL ISOLATED APPLICATION EXPERIMENT SERIES
Richard R. Levin *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 209-213 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The technical, operational, and economic readiness of parabolic dish power systems for a variety of applications in the power range below 10 MWe are discussed. Power systems are developed and tested to the point where commercialization efforts lead to successful market penetration. A key element in this strategy is the use of experiments to test hardware and assess operational readiness. The Isolated Application Experiments are described and their objectives discussed. S.F.

N81-30549*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INDUSTRIAL APPLICATION EXPERIMENT SERIES
Steven A. Bluhm *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 215-216 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Two procurements within the Industrial Application Experiment Series of the Thermal Power Systems Project are discussed. The first procurement, initiated in April 1980, resulted in an award to the Applied Concepts Corporation for the Capital Concrete Experiment: two Fresnel concentrating collectors will be evaluated in single-unit installations at the Jet Propulsion Laboratory Parabolic Dish Test Site and at Capitol Concrete Products, Topeka, Kansas. The second procurement, initiated in March 1981, is titled, 'Thermal System Engineering Experiment B.' The objective of the procurement is the rapid deployment of developed parabolic dish collectors. S.F.

N81-30550*# Applied Concepts Corp., Reston, Va.
A FRESNEL COLLECTOR PROCESS HEAT EXPERIMENT AT CAPITOL CONCRETE PRODUCTS
J. Scott Hauger *In* JPL Parabolic Dish Solar Thermal Poweer Ann. Program Rev. Proc. 1 May 1981 p 217-221 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

An experiment is planned, conducted and evaluated to determine the feasibility of using a Power Kinetics' Fresnel concentrator to provide process heat in an industrial environment. The plant provides process steam at 50 to 60 psig to two autoclaves for curing masonry blocks. When steam is not required, the plant preheats hot water for later use. A second system is installed at the Jet Propulsion Laboratory parabolic dish test site for hardware validation and experiment control. Experiment design allows for the extrapolation of results to varying demands for steam and hot water, and includes a consideration of some socio-technical factors such as the impact on production scheduling of diurnal variations in energy availability. S.F.

N81-30551*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARKET ASSESSMENT OVERVIEW
Hamid Habib-agahi *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 241-246 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 05C

Market assessment, refined with analysis disaggregated from a national level to the regional level and to specific market applications, resulted in more accurate and detailed market estimates. The development of an integrated set of computer simulations, coupled with refined market data, allowed progress in the ability to evaluate the worth of solar thermal parabolic dish systems. In-depth analyses of both electric and thermal market applications of these systems are described. The following market assessment studies were undertaken: (1) regional analysis of the near term market for parabolic dish systems; (2) potential early market estimate for electric applications; (3) potential early market estimate for industrial process heat/cogeneration applications; and (4) selection of thermal and electric application case studies for fiscal year 1981. S.F.

N81-30552*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COST GOALS
John Hoag *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 247-250 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 05C

Cost goal activities for the point focusing parabolic dish program are reported. Cost goals involve three tasks: (1) determination of the value of the dish systems to potential users; (2) the cost targets of the dish system are set out; (3) the value side and cost side are integrated to provide information concerning the potential size of the market for parabolic dishes. The latter two activities are emphasized. S.F.

N81-30553*# Science Applications, Inc., Golden, Colo.
AN ASSESSMENT OF THE INDUSTRIAL COGENERATION MARKET FOR PARABOLIC DISH SYSTEMS
J. W. Doane *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 251-253 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The value analysis technique used is straightforward. Maximum allowable life-cycle system cost for the cogeneration system is determined as the sum of the present value of fuels displaced plus the present value of revenues from exported power. Each conventional fuel displaced is described by a unit cost in the first year, a uniform annual consumption rate, and a uniform annual escalation rate for unit cost. Exported energy flows are treated the same as displaced energy. S.F.

N81-30554*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Chemical and Biological Processes Section.
ADVANCED DEVELOPMENT: FUELS
Kumar Ramohalli *In its* Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 257-261 ref Sponsored by DOE (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The solar thermal fuels and chemicals program at Jet Propulsion Laboratory are described. High technology is developed and applied to displace fossil fuel (oil) use in the production/processing of valuable fuels and chemicals. The technical and economic feasibility is demonstrated to extent that enables the industry to participate and commercialize the product. A representative process, namely Furfural production with a bottoming of acetone, butanol and ethanol, is described. Experimental data from all solar production of furfural is discussed. Estimates are given to show the attractiveness of this process, considering its flexibility to be adaptable to dishes, troughs or central receivers. Peat, lignite and low rank coal processing, heavy

oil stripping and innovative technologies for process diagnostics and control are mentioned as examples of current projects under intensive development. S.F.

N81-30555*# IIT Research Inst., Chicago, Ill.
FUELS AND CHEMICALS FROM BIOMASS USING SOLAR THERMAL ENERGY
G. Giori, R. Leitheiser (Quaker Oats Co.), and M. Wayman (Toronto Univ.) *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 263-267 ref (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The significant nearer term opportunities for the application of solar thermal energy to the manufacture of fuels and chemicals from biomass are summarized, with some comments on resource availability, market potential and economics. Consideration is given to the production of furfural from agricultural residues, and the role of furfural and its derivatives as a replacement for petrochemicals in the plastics industry. S.F.

N81-30556*# Midwest Research Inst., Golden, Colo.
SOLAR THERMAL MATERIALS RESEARCH AND DEVELOPMENT
B. P. Gupta *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 269-273 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Objectives of the Materials Research and Development effort are examined. The behavior and interaction of different materials used in solar thermal technologies are studied so as to create a sound technical base for future system and component designs. Materials are developed to extend the application potential of systems by either making materials more reliable in difficult operating environments or by offering lower cost alternatives to presently used materials. Solar thermal systems designed for electric power, industrial process heat from low to high temperature, and fuels and chemicals applications are discussed. S.F.

N81-30557*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR ENERGY WATER DESALINATION IN THE UNITED STATES AND SAUDI ARABIA
Werner Luft and Jim William *In* JPL Parabolic Dish Solar Thermal Power Ann. Program Rev. Proc. 1 May 1981 p 275-282 (For primary document see N81-30525 21-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Five solar energy water desalination systems were designed to deliver 6000 cubic m/day of desalted water from either seawater or brackish water. Two systems will be selected for pilot plant construction. The pilot plants will have capacities in the range of 100 to 400 m/day. Goals of the Project Agreement for Cooperation in the Field of Solar Energy, under the auspices of the United States-Saudi Arabian Joint Commission on Economic Cooperation, are to: (1) cooperate in the field of solar energy technology for the mutual benefit of the two countries, including the development and stimulation of solar industries within the two countries; (2) advance the development of solar energy technology in the two countries; and (3) facilitate the transfer between the two countries of technology developed under this agreement. S.F.

N81-30558*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LOW-COST SOLAR ARRAY STRUCTURE DEVELOPMENT
Abraham H. Wilson 15 Jun. 1981 49 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-164716; JPL-Pub-81-30; DOE/JPL-1012-53) Avail: NTIS HC A06/MF A01 CSCL 10A

Early studies of flat-plate arrays have projected costs on the order of $50/square meter for installed array support structures. This report describes an optimized low-cost frame-truss structure that is estimated to cost below $25/square meter, including all markups, shipping an installation. The structure utilizes a planar frame made of members formed from light-gauge galvanized steel sheet and is supposed in the field by treated-wood trusses that are partially buried in trenches. The buried trusses use the overburden soil to carry uplift wind loads and thus to obviate reinforced-concrete foundations. Details of the concept, including design rationale, fabrication and assembly experience, structural testing and fabrication drawings are included. Author

N81-30559*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REGIONAL CHARACTERISTICS RELEVANT TO ADVANCED TECHNOLOGY COGENERATION DEVELOPMENT
Ram Manvi Jul. 1981 155 p refs Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-164697; JPL-Pub-81-61) Avail: NTIS HC A08/MF A01 CSCL 10B

To assist DOE in establishing research and development funding priorities in the area of advanced energy conversion technoloy, researchers at the Jet Propulsion Laboratory studied those specific factors within various regions of the country that may influence cogeneration with advanced energy conversion systems. Regional characteristics of advanced technology cogeneration possibilities are discussed, with primary emphasis given to coal derived fuels. Factors considered for the study were regional industry concentration, purchased fuel and electricity prices, environmental constraints, and other data of interest to industrial cogeneration. A.R.H.

N81-30560*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCEPTS FOR DESIGN OF AN ENERGY MANAGEMENT SYSTEM INCORPORATING DISPERSED STORAGE AND GENERATION
H. Kirkham, T. Koerner, and D. Nightingale 15 Apr. 1981 135 p refs
(Contracts NAS7-100; Contract DE-AI01-79ET-29372)
(NASA-CR-164700; JPL-Pub-81-20; DOE/ET-29372/1) Avail: NTIS HC A07/MF A01 CSCL 10B

New forms of generation based on renewable resources must be managed as part of existing power systems in order to be utilized with maximum effectiveness. Many of these generators are by their very nature dispersed or small, so that they will be connected to the distribution part of the power system. This situation poses new questions of control and protection, and the intermittent nature of some of the energy sources poses problems of scheduling and dispatch. Under the assumption that the general objectives of energy management will remain unchanged, the impact of dispersed storage and generation on some of the specific functions of power system control and its hardware are discussed. A.R.H.

N81-30561*# Stonehart Associates, Inc., Madison, Conn.
PREPARATION AND EVALUATION OF ADVANCED ELECTROCATALYSTS FOR PHOSPHORIC ACID FUEL CELLS Quarterly Report, Apr. - Jun. 1981
Paul Stonehart, John Baris, John Hochmuth, and Peter Pagliaro 30 Jun. 1981 26 p
(Contracts DEN3-176; DE-A103-80ET-17088)
(NASA-CR-165425; DOE/NASA/0176-81/2; QR-6) Avail: NTIS HC A03/MF A01 CSCL 10A

The highest performance fuel cell cathode electrocatalyst combination ever observed gives 755 mV vs hydrogen at 100 ASF on air at 180 C and shows a potential improvement to 775 mV vs hydrogen for better electrode structures. A pressurized fuel cell (UTC at 5 atm) would then give 805 mV at 320 ASF and 180 C. Another activity diagnostic is the performance of this electrocatalyst on oxygen at 900 mV vs hydrogen. The value for electrocatalyst is 44 mA per milligram of platinum and is projected to reach 60 mA per milligram of platinum with improved electrode structures. Since the electrocatalyst surface area and the electrode structure are not yet optimized there is considerable room for performance enhancement beyond these values, especially at higher temperatures. A.R.H.

N81-30562*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST RESULTS OF THE CHRYSLER UPGRADED AUTOMOTIVE GAS TURBINE ENGINE: INITIAL DESIGN Final Report
David Horvath, Guy H. Ribble, Jr., Edward L. Warren, and James C. Wood Jul. 1981 66 p refs
(Contract DE-AI01-77CS-51040)

(NASA-TM-81660; DOE/NASA/51040-22; E-676) Avail: NTIS HC A04/MF A01 CSCL 10B

The upgraded engine as built to the original design was deficient in power and had excessive specific fuel consumption. A high instrumented version of the engine was tested to identify the sources of the engine problems. Analysis of the data shows the major problems to be low compressor and power turbine efficiency and excessive interstage duct losses. In addition, high HC and CO emission were measured at idle, and high NOx emissions at high energy speeds. T.M.

N81-30563*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

QUALIFICATION TESTING OF SECONDARY STERILIZABLE SILVER-ZINC CELLS FOR USE IN THE JUPITER ATMOSPHERIC ENTRY PROBE

Michelle A. Manzo Jul. 1981 16 p

(NASA-TM-82638; E-893) Avail: NTIS HC A02/MF A01 CSCL 10C

A series of qualification tests were run on the secondary, sterilizable silver oxide - zinc cell developed at the NASA Lewis Research Center to determine if the cell was capable of providing mission power requirements for the Jupiter atmospheric entry probe. The cells were tested for their ability to survive radiation at the levels predicted for the Jovian atmosphere with no loss of performance. Cell performance was evaluated under various temperature and loading conditions, and the cells were tested under various environmental conditions related to launch and to deceleration into the Jovian atmosphere. The cell performed acceptably except under the required loading at low temperatures. The cell was redesigned to improve low-temperature performance and energy density. The modified cells improved performance at all temperatures. Results of testing cells of both the original and modified designs are discussed. Author

N81-30564# Army Construction Engineering Research Lab., Champaign, Ill.

DEVELOPMENT OF AN ACCEPTANCE TEST FOR SOLAR ENERGY SYSTEMS Final Report

D. M. Joncich and D. L. Johnson Jun. 1981 83 p refs

(AD-A101654; CERL-TR-E-173) Avail: NTIS HC A05/MF A01 CSCL 10/1

This report describes the development and field evaluation of a short-duration procedure and an instrumentation package for testing whether a newly installed solar energy system is performing to design specifications. The U.S. Army Construction Engineering Research Laboratory: (1) defined a general solar system schematic and identified its major components; (2) developed test procedures for determining the thermal performance of these components; (3) bought and programmed equipment to perform the prescribed component test and to produce the test data; (4) subjected the acceptance test concept and instrumentation package to a field evaluation at a newly installed Army solar energy system; and (5) incorporated the results of the field evaluation as modifications to the solar acceptance test. This report concludes that a simple, quantitative test of short duration can determine whether a newly installed solar system is operating as specified. The results of the research have revealed the potential for performing such a test with low-cost metering installed at the time of building construction.

Author (GRA)

N81-30565# Hughes Aircraft Co., Los Angeles, Calif. Space and Communications Group.

HIGH EFFICIENCY SOLAR PANEL. PHASE 2: GALLIUM ARSENIDE Final Report, 15 Sep. 1977 - 30 Sep. 1980

George Wolff, Sanjiv S. Kamath, and George J. Vendura Wright-Patterson AFB, Ohio AFWAL Mar. 1981 127 p refs

(Contract F33615-77-C-3150; AF Proj. 682J)

(AD-A101317; HAC-SCG-00453R; AFWAL-TR-80-2128) Avail: NTIS HC A07/MF A01 CSCL 10/2

The goals of the GaAs High Efficiency Solar Panel Program were to demonstrate experimentally that space cells with efficiencies of 16% or better can be consistently produced. In developing the cells, fabrication processes were to be streamlined and perfected so cells are readily producible in large quantities. All the goals of the program were met in that the process for growing cells with efficiencies greater than 16% was fully developed. Cells with efficiencies greater than 18% were produced. A comprehensive qualification test program was successfully conducted, and the GaAs cells are now fully space qualified.

Author (GRA)

N81-30566# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

TECHNICAL AND ECONOMIC EVALUATION OF A BRAYTON-RANKINE COMBINED CYCLE SOLAR-THERMAL POWER PLANT

J. D. Wright and Richard J. Copeland May 1981 6 p refs Presented at Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26-30 May 1981 Submitted for publication

(Contract DE-AC02-77CH-00178)

(SERI/TP-631-1154; CONF-810509-36) Avail: NTIS HC A02/MF A01

An assessment of gas-liquid direct-contact heat exchange and of a new storage-coupled system was conducted. Both technical and economic issues are evaluated. Specifically, the storage-coupled combined cycle is compared with a molten salt system. The open Brayton cycle system is used as a topping cycle, and the reject heat powers the molten salt/Rankine system. In this study the molten salt system is left unmodified, the Brayton cycle is integrated on top of a Marietta description of an existing molten salt plant. This compares a nonoptimized combined cycle with an optimized molten salt system. DOE

N81-30567# Midwest Research Inst., Golden, Colo.

OPTIMIZING THE PERFORMANCE OF DESICCANT BEDS FOR SOLAR-REGENERATED COOLING

R. Barlow and K. Collier Mar. 1981 5 p refs Presented at Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26 May 1981

(Contract DE-AC02-77CH-00178)

(SERI/TP-631-1157; CONF-810509-28) Avail: NTIS HC A02/MF A01

The use of computer simulations as well as a simplified psychrometric analysis to determine the increase in cooling system performance that can be realized through the use of nonhomogeneous or staged desiccant beds was investigated. A staged bed of four hypothetical desiccants gives, a 10% higher cooling capacity than a silica gel bed of the same thickness. Alternatively, the same cooling capacity is produced by a staged bed 37% thinner than the silica gel bed. It is suggested that these effects can be employed to reduce the parasitic power requirements of deciccant cooling systems. DOE

N81-30568# Midwest Research Inst., Golden, Colo.

MIS AND PN JUNCTION SOLAR CELLS ON THIN FILM POLYCRYSTALLINE SILICON

A. Ariotedjo, K. Emery, G. Cheek, P. Pierce, and T. Surek May 1981 5 p refs Presented at 15th IEEE PV Specialists Conf., Orlando, Fla., 11 May 1981

(Contract DE-AC02-77CH-00178)

(SERI/TP-614-1214; CONF-810526-9) Avail: NTIS HC A02/MF A01

The potential of MIS type solar cells for low cost terrestrial photovoltaic systems were assessed. Performance, stability, and cost effectiveness were among the factors studied. Several types of MIS and SIS solar cells are included in the matrix study. The MIS and p/n junction solar cells are compared on essentially identical thin film polycrystalline silicon materials. Preliminary data on the different cell structures on thin film epitaxial silicon on metallurgical grade substrates are presented. DOE

N81-30569# Midwest Research Inst., Golden, Colo.

SPECIALISTS' WORKSHOP ON FAST PYROLYSIS OF BIOMASS

1980 421 p refs Presented at Workshop held at Copper Mountain, Colo., 20 Oct. 1980

(Contract DE-AC02-77CH-00178)

(SERI/CP-622-1096) Avail: NTIS HC A18/MF A01

Significant findings in the area of fast pyrolysis of biomass or biomass derived materials are presented with the goal of attaining a better understanding of the dominant mechanisms which produce olefins, oxygenated liquids, char, and tars. In addition, background papers are given in hydrocarbon pyrolysis, slow pyrolysis of biomass, and techniques for powdered feedstock

preparation. In general the authors were requested to present summaries of experimental data with as much interpretation of that data as possible with regard to mechanisms and process variables such as heat flux, temperatures, partial pressure, feedstock, particle size, heating rates, residence time, etc. DOE

N81-30570# Butler Mfg. Co., Grandview, Mo.
TEST BUILDING INSTRUMENTATION COOPERATIVE AGREEMENT: HEATING/DAYLIGHTING PROTOTYPE DEVELOPMENT. PHASE 2: PASSIVE AND HYBRID SOLAR MANUFACTURED BUILDING PROJECT Project Status Report, 16 Apr. 1980 - 16 Mar. 1981
Lawrence L. Lindsey and Marvin K. Snyder 23 Mar. 1981 8 p Prepared in cooperation with Princeton Energy Group, N.J.
(Contract DE-FC02-80CS-30367)
(DOE/CS-30367/T1; PSR-2) Avail: NTIS HC A02/MF A01

Progress is reported on the instrumentation and problems encountered are described. An instrumentation trip report is presented dealing with installation of data acquisition systems, roof and roll runner building. DOE

N81-30571# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MIS SILICON SOLAR CELLS: POTENTIAL ADVANTAGES
G. Cheek, R. Mertens (ESAT, Heverlee, Belgium), and K. U. Leuven (ESAT, Heverlee, Belgium) May 1981 6 p refs Presented at 15th IEEE PV Specialists Conf., Orlando, Fla.
(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)
(SERI/TP-612-1190; CONF-810526-10) Avail: NTIS HC A02/MF A01

Recent progress with silicon solar cells based on the MIS or SIS structure was reviewed. To be competitive with pn junction technology in the near term, these cells must be much cheaper or have a higher efficiency in a production environment. Apparently, the minority carrier MIS cells have the greatest potential for large scale applications. The data currently indicate that all types of MIS/SIS cells have some inherent instability problems. DOE

N81-30572# South Carolina Energy Research Inst., Columbia.
RESIDUAL ENERGY APPLICATIONS PROGRAM SYSTEMS ANALYSIS REPORT
P. W. Yngve Oct. 1980 228 p refs
(Contract DE-AC09-77ET-12866)
(DOE/ET-12866/3) Avail: NTIS HC A11/MF A01

Current DOE plans call for building an Energy Applied Systems Test (EAST) Facility at the Savannah River Plant in close proximity to the 140 to 150 F waste heat from one of several operating nuclear reactors. The waste water flow from each reactor, approximately 165,000 gpm, provides a unique opportunity to test the performance and operating characteristics of large-scale waste heat power generation and heat pump system concepts. This report provides a preliminary description of the potential end-use market, parametric data on heat pump and the power generation system technology, a preliminary listing of EAST Facility requirements, and an example of an integrated industrial park utilizing the technology to maximize economic pay back. DOE

N81-30573# HITEK, Inc., Sweet Home, Oreg.
KEITH KEESECKER OFFICE BUILDING Final Technical Report
Charles L. Bliege 26 Jan. 1981 52 p
(Contracts DE-FC03-78CS-32144; EM-78-F-03-2144)
(DOE/CS-32144/T1) Avail: NTIS HC A04/MF A01

The solar collection system of an office building in oregon is described. This two story office building has 4000 sq ft of space and a sq ft basement. The solar heating system has 936 sq ft of flat plate collectors and a phase change storage system. A description of the system operation, the acceptance test plan, as built wiring and piping schematics, and predicted performance data are included. DOE

N81-30574# Sandia Labs., Albuquerque, N. Mex. Systems and Applications Development Div.
CLEANING STRATEGIES FOR PARABOLIC-TROUGH SOLAR-COLLECTOR FIELDS; GUIDELINES FOR DECISIONS
Kenneth D. Bergeron and James M. Freese Jun. 1981 54 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0385) Avail: NTIS HC A04/MF A01

The guidelines are based on information obtained in past research studies, as well as interviews with vendors and users of cleaning and water treatment equipment. The basic procedure recommended utilizes high pressure portable washing equipment. However, since the cleaning problem is so site-specific, no single, detailed approach can be specified. A systematic procedure for evaluating the particular requirements of a site is therefore given. This will allow the solar energy system operator to develop a cleaning strategy which is cost effective because it is suited to local conditions. DOE

N81-30575# Sandia Labs., Albuquerque, N. Mex. Systems and Applications Development Div.
INITIAL EXPERIENCE AND PRELIMINARY RESULTS: SOLAR COLLECTOR MATERIALS EXPOSURE TO THE IPH SITE ENVIRONMENT
Duane E. Randall and Virgina L. Morris Mar. 1981 192 p refs Prepared in cooperation with McDonnell-Douglas Astronautics, Co., Huntington Beach, Calif.
(Contract DE-AC04-76DP-00789)
(SAND-81-0290) Avail: NTIS HC A09/MF A01

The influence of the industrial plant site environment upon the performance characteristics of solar collector reflector and receiver materials was evaluated at industrial process heat solar project sites. The program demonstrates that the industrial environment offers a variety of sources that affect the optical characteristics of reflectors and receivers through the mechanisms of soiling and corrosion. DOE

N81-30576# Sandia Labs., Albuquerque, N. Mex. Solar Energy Projects.
REAL-TIME PERFORMANCE TESTING OF PHOTOVOLTAIC-CONCENTRATOR MODULES
D. A. Pritchard 1981 5 p refs Presented at the 15th IEEE PV Specialists' Conf., 11 May 1981, Orlando, Fla.
(Contract DE-AC04-76DP-00789)
(SAND-81-1145C; CONF-810526-11) Avail: NTIS HC A02/MF A01

A description of the resources at the Photovoltaic Advanced Systems Test Facility is presented. These resources include a multi-level data acquisition system for collector module performance testing, associated user-interactive software for accomplishing these tests, and extensive support hardware. A group of standard tests was developed for module characterization. Descriptions of these tests ans sample results for a variety of module designs are presented. DOE

N81-30577# Sandia Labs., Albuquerque, N. Mex.
COMPATIBILITY OF FRESNEL LENSES AND PHOTOVOLTAIC CELLS IN CONCENTRATOR MODULES
C. B. Stillwell and B. D. Shafer 1981 4 p refs Presented at the 15th IEEE Photovoltaic Specialists' Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1191C; CONF-810526-25) Avail: NTIS HC A02/MF A01

Test data are used to compare, for point focus photovoltaic concentrator modules, the relationship between Fresnel lens and module efficiency. the data shows that lenses designed for maximum optical efficiency may not produce the maximum module efficiency. Lenses designed with consideration for the photon flux distribution on the solar cell may improve module efficiency possibly at some loss in lens optical performance. DOE

N81-30578# Sandia Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC CONCENTRATOR TECHNOLOGY
E. C. Boes and B. D. Shafer 1981 6 p refs Presented at the 15th IEEE PV Spec. Conf., 11 May 1981, Orlando, Fla.
(Contract DE-AC04-76DP-00789)
(SAND-81-1211C; CONF-810526-21) Avail: NTIS HC A02/MF A01

The most significant of the recent advances in the development of concentrating photovoltaic collectors are described. Highlights are: in moderate volume production (100,000 sq m per year), current designs could be sold for $3.70 to $5.20 per annualized

peak watt, completely installed; several array designs have annual efficiencies of 10 to 13 percent, developmental have achieved 16 percent; and concentrator Si cells were tested above 20 percent at 27 C and 50X. DOE

N81-30579# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESIDENTIAL PHOTOVOLTAIC POWER SYSTEMS FOR THE NORTHEAST
Miles C. Russell 1981 5 p Presented at the 15th IEEE Photovoltaic Specialists' Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/132; CONF-810526-24) Avail: NTIS HC A02/MF A01

The construction and testing of five Prototype Systems are reported. Each of these systems utilizes a roof-mounted photovoltaic array and allows excess solar-generated electric energy to be fed back to the local utility grid, eliminating the need for on-site storage. Specific features of the five Prototype Systems now under test are presented, and performance results to date are discussed. DOE

N81-30580# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESIDENTIAL PHOTOVOLTAIC SYSTEM DESIGNS
M. C. Russell 1981 5 p refs Presented at the 15th IEEE PV Specialists' Conf., Orlando, Fla., 11 May 1981 and 16th Intersoc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/123; CONF-810526-17) Avail: NTIS HC A02/MF A01

The construction and testing of five Prototype Systems are described. All systems utilize a roof-mounted photovoltaic array and allow excess solar-generated electric energy to be fed back to the local utility grid, eliminating the need for on-site storage. Residential photovoltaic system design issues are discussed an specific features of the five Prototype Systems are presented. DOE

N81-30581# Sandia Labs., Albuquerque, N. Mex.
INTERDIGITATED BACK CONTACT SOLAR CELL WITH HIGH-CURRENT COLLECTION
C. M. Garner, R. D. Nasby, F. W. Sexton, J. L. Rodriguez, and D. P. Norwood 1981 8 p refs Presented at the 15th IEEE PV Specialists' Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-80-2206C; CONF-810526-13) Avail: NTIS HC A02/MF A01

Internal current collection efficiencies greater than 90% and energy conversion efficiencies of 18 % at 30 suns were measured on a laboratory version of the interdigitated back contact (IBC) solar cell. A phosphorous gettering diffusion was performed on the front surface and then etched off to achieve these high current collection efficiencies. Thermal oxides were grown on the front and back of the cell to passivate the silicon surfaces. Although the internal collection efficiencies of the cell were high, series resistance caused the fill factor (FF) to decrease at concentrations above 30 suns. Dark current measurements on cells with a new grid spacing indicate that the series resistance is much lower than in the previous cell design. It is suggested that this should result in higher efficiencies at high concentration. DOE

N81-30582# Hawaii Community Design Center, Honolulu.
HOME ENERGY SAVER'S HANDBOOK Final Report
Noreen N. Koga, ed. Sep. 1980 43 p refs
(Contracts DE-FG03-78SF-01910; EM-78-G-03-1910)
(DOE/SF-01910/T1) Avail: NTIS HC A03/MF A01

Energy is described and how much energy a household consumes is discussed. The saving of energy is recommended and measures to save energy when operating hot water heaters, air conditioners, lighting systems refrigerators, freezers, stoves, microwave ovens, washing machines, clothes dryers, dishwashers, television sets, and portable appliances are summarized. DOE

N81-30583# Los Alamos Scientific Lab., N. Mex.
OPTICAL METHOD FOR DETERMINING THE STATE OF CHARGE OF A LEAD-ACID BATTERY
C. R. Derouin, R. E. Bobbett, J. B. McCormick, and W. J. Kerwin (Arizona Univ., Tucson) 1981 5 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1116) Avail: NTIS HC A02/MF A01

An optic device which utilizes the index of refraction and critical angle to determine the state of charge of a lead acid battery is discussed. The approach utilizes the change in the index of refraction of the battery acid vs. battery state of charge. The dynamic hydrometer is a float similar to the one used in a normal hydrometer whose position can be continuously monitored with a capacity sensor. The advantage is that the liquid level in the battery does not affect the reading, only the specific gravity is indicated. It is concluded that with the proper adjustment of angles, the instrument can be used for in situ monitoring of many chemical processes in which the index of refraction is used as an indicator. E.A.K.

N81-30584# Aerospace Research Applications Center, Indianapolis, Ind.
INSIDE STORM WINDOW
Jerome I. Kaplan Nov. 1980 25 p refs
(Contract DE-FG02-79R5-10116)
(DOE-R5/10116/T1; EERD-80-021) Avail: NTIS HC A02/MF A01

The work effort to design, build, install, and evaluate an inside storm window (ISW) is presented. The ISW, made of two separated layers of mylar (like a thermopane window) which, when not in use can be rolled up in a shade, is described. The work effort included: development of a prototype model; the development of production facilities to turn out a small number (50) of ISW's; the production of the windows; the installation of the windows into buildings; the building of a test chamber to determine the R value of the ISW and the subsequent determination of the R value; and a survey to determine how the residents of the homes in which ISW's were installed felt about the windows. DOE

N81-30585# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
REGIONAL ANALYSIS OF ENERGY FACILITY SITING
F. W. Lipfert, P. M. Meier, and L. I. Kleinman 1980 37 p refs Presented at the SOGESTA Workshop on Energy Policy Analysis, Urbino, Italy, 3-6 Nov. 1980
(Contract DE-AC02-76CH-00016)
(BNL-29324; CONF-801137-5) Avail: NTIS HC A03/MF A01

Some of the regional environmental parameters of energy facility siting with emphasis on air quality impacts were examined. An example of a siting optimization study is presented, and it is shown how difficult it presently is to specify an environmental objective function that is universally applicable. The importance of regional background effects are discussed, and long range transport models are used to analyze the relative importance of local and long range impacts. DOE

N81-30586# Department of Housing and Urban Development, Washington, D. C. Office of Policy Development and Research.
NEW ENERGY-CONSERVING PASSIVE SOLAR SINGLE-FAMILY HOMES. CYCLE 5, CATEGORY 2: HUD SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM
Jan. 1981 283 p refs
(HUD-PDR-664) Avail: NTIS HC A13/MF A01

Information is presented to help builders and lenders to understand passive solar design, to recognize passive solar buildings, and to provide specific design, construction, and marketing suggestions and details. The concept of passive solar energy is discussed. Each of the 91 solar homes is described. Issues of climate requirements and site design concerns are included. DOE

N81-30587# Battelle Pacific Northwest Labs., Richland, Wash.
COMPRESSED AIR ENERGY STORAGE TECHNOLOGY PROGRAM Annual Report
L. D. Kannberg Jun. 1981 201 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3804) Avail: NTIS HC A10/MF A01

Major research funded under the Compressed Air Energy

Storage Technology Program during the period March 1980 to March 1981 is reported. The annual report is divided into two segments: (1) reservoir stability studies and (2) second generation concepts studies. The first study represents research performed to establish stability criteria for CAES reservoirs while the second study reports progress on research performed on second generation CAES concepts. DOE

N81-30588# Sandia Labs., Livermore, Calif. Surface Metallurgy Div.

DEVELOPMENT OF SOLAR ENERGY IN PERU

Hugo O. Pierson and Alipio Nahui (ITINTEC, Lima, Peru) Jun. 1981 24 p refs

(Contract DE-AC04-76DP-00789)

(SAND-81-0764) Avail: NTIS HC A02/MF A01

Development of solar energy technology utilization in Peru is discussed. Peru receives a high degree of solar radiation (except for part of its coastal area) and has almost an ideal climate for the development of solar energy. The development of low temperature applications, including the design of passive solar heated buildings for the high Andes, the design and evaluation of various types of solar water heaters and crop dryers for both household and industrial uses (based on flat plate collectors), and the construction of a desalinization prototype plant are reported. Photovoltaic systems are investigated for suitable applications and have an excellent potential, especially in telecommunications. DOE

N81-30589# Acurex Corp., Mountain View, Calif.

APPLICATION OF SOLAR ENERGY FOR THE GENERATION AND SUPPLY OF INDUSTRIAL-PROCESS LOW-TO INTERMEDIATE-PRESSURE STEAM RANGING FROM 3000 F - 5500 F (HIGH-TEMPERATURE STEAM) Final Report, 30 Sep. 1978 - 30 Jun. 1979

Marx Matteo, John Kull, William Luddy, and Stanley Youngblood Dec. 1980 269 p refs

(Contracts DE-AC03-78CS-32196; ET-78-C-03-2196)

(DOE/CS-32196/T1; SAN-2196-1) Avail: NTIS HC A12/MF A01

A design developed for a solar industrial process heat system to be installed at a bulk oil storage terminal in Mobile, Alabama is described. The 1874 sq m solar energy collector field will generate industrial process heat at temperatures ranging from 150 to 2900 C. The heat will be used to reduce the viscosity of stored No. 6 fuel oil, making it easier to pump from storage to transport tankers. Heat transfer oil is circulated in a closed system, absorbing heat in the collector field and delivering it through immersed heat exchangers to the stored fuel oil. The solar energy system will provide approximately 44% of the process heat required. DOE

N81-30590# Fisher (Evan D.), Bellaire, Mich.

WIND TO HEAT CONVERTER Final Technical Report

Evan D. Fisher 6 Mar. 1981 56 p

(Contract DE-FG02-79R5-10120)

(DOE/R5-10120/2) Avail: NTIS HC A04/MF A01

The feasibility of a wind driven machine which converts wind energy directly to heat was demonstrated through: the action of the impellor of a windmill driving; suitable shafting and gearing; and a rotary hydraulic brake which absorbs the power by converting the mechanical energy into heat. Resistance is created exclusively by fluid friction and agitation of the hydraulic oil circulated between the vaned members of the converter. A prototype model was constructed and erected on a hilltop site adjacent to a building. It is connected to the building's heating system and its performance is evaluated. DOE

N81-30591# Little (Arthur D.), Inc., Cambridge, Mass.

SOLAR HEATING AND COOLING (SHAC) SIMULATION PROGRAMS: ASSESSMENT AND EVALUATION. VOLUME 1: SUMMARY REPORT Final Report

Richard L. Merriam May 1981 26 p refs

(EPRI Proj. 1269-1)

(EPRI-EM-1866) Avail: NTIS HC A03/MF A01

Solar heating and cooling system simulation programs available to use by electric utilities was evaluated. A comprehensive reference manual describing the characteristics of computer programs and manual methods was developed. An analysis of the intended capabilities of 11 programs is carried out. The programs are described and ranked by application. Four programs (AXCESS, DEROB, EMPSS, TRNSYS) for three building types (residential, light commercial, and heavy commercial) and three heating and cooling system classes (conventional, active solar, passive solar are tested. The results are compared and related to the program analytical bases. The user experience encountered during the program testing is highlighted and the user related factors for the four programs are compared. The applicability of the 11 programs to utilities is explored. DOE

N81-30592# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

MODEL TESTS OF A BASELINE 40 MW OTEC PILOT PLANT. VOLUME A: NARRATIVE REPORT

J. F. George, J. T. Stadler, H. L. Donnelly, D. Richards, F. N. Biewer (Offshore Technology Corp.), and B. L. Hutchinson (The Glosten Associates, Inc.) Jan. 1981 174 p refs

(Contract DE-AI01-77ET-20342)

(JHU/APL-SR-81-1A) Avail: NTIS HC A08/MF A01

A baseline design of an ocean thermal energy conversion (OTEC) pilot plant, configured as a floating platform for large scale, at-sea, practical demonstrations of OTEC system operation, has been completed. Model tests at 1/30 scale were conducted in a model basin. Waves were produced to simulate a variety of ocean conditions, including 100- year storm seas where hurricane waves equivalent to a maximum height of 65 ft were created. The platform survived all simulated conditions, although it was observed that a shaped bow, bilge keels, and additional hull length would improve seakeeping in the hurricane seas. Quantitative data were obtained on ship motions, cold water pipe loads and motions, mooring forces, and seawater system pressures. DOE

N81-30593# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.

FACILITIES DEVELOPMENT, SAN DIEGO, CALIFORNIA SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION, JANUARY 1980 - DECEMBER 1980

K. D. Evans 1980 82 p refs

(Contract DE-AC01-79CS-30027)

(SOLAR/1017-80/14) Avail: NTIS HC A05/MF A01

A 31-unit apartment site which uses 520 square of flat-plate collectors for domestic water heating is discussed. A 1,000 gallon glass-lined storage tank is located underground. The overall solar fraction is 35 percent. Problems are discussed. DOE

N81-30594# Institute for Telecommunication Sciences, Boulder, Colo.

ALTERNATE FREQUENCY ANALYSIS FOR THE SOLAR POWER SYSTEM

E. L. Morrison and W. B. Grant 1981 147 p refs

(Contract DE-AI01-80ER-10160)

(DOE/ER-10160/T5) Avail: NTIS HC A03/MF A01

Frequencies below the proposed 2.45 GHz are not recommended because of increased compatibility problems with a large population of existing systems and target spacebeams and rectenna areas. Higher frequencies increase troposphere interactions which significantly reduce system efficiency during storm conditions. The increased media modulation effects at higher frequencies complicate the spacetenna control functions, including the stability of the main beam aim point and side lobe amplitude control loops. DOE

N81-30595# McDermott (J. Ray) Co., Inc., New Orleans, La. Technical Research and Development Dept.

CONCEPTUAL DESIGN STUDY: COLD WATER PIPE SYSTEMS FOR SELF-MOUNTED OTEC POWERPLANTS Final Report

Feb. 1981 82 p refs Prepared in cooperation with Giannotti and Associates, Inc., Annapolis, Md.

(Contracts DE-AI01-79CS-20396; NOAA-80-SAC-00621)

(DOE/NOAA/OTEC-36) Avail: NTIS HC A04/MF A01

The conceptual design and installation aspects of cold water pipes (CWP) systems for shelf mounted OTEC power plants in Puerto Rico and Hawaii are considered. The CWP systems using Fiberglass Reinforced Plastic (FRP) and steel were designed; the FRP, can be controlled by varying the core thickness; and

steel is used as a structural material in offshore applications. A marine railway approach was chosen for installation of the CWP. Two methods for pulling the track for the railway down the pipe fairway to its final location are presented. The track is permanently fastened to the sloping seabed with piles installed by a remotely controlled cart that rides on the track itself. Both the marine railway and the shelf mounted platform that houses the OTEC power plant require an anodic or equivalent corrosion protection system. DOE

N81-30596# Canby Area Vocational Technical Inst., Minn.
ENZYMATIC CONVERSION OF CROP RESIDUE TO GLUCOSE AND ALCOHOL Technical Report, 1 Aug. 1979 - 31 Jan. 1981
Larry Brooks 31 Jan. 1981 20 p refs
(Contract DE-FG05-79R5-10131)
(DOE/R5-10131/2) Avail: NTIS HC A02/MF A01

The consistent production of high quality cellulase enzyme on a pilot plant scale was studied. The minimum equipment required to build the plant, the cost of the equipment, and the production cost of one gallon of ethanol were determined. The cellulase enzyme was used to hydrolyze celluloses to fermentable sugars. Cellulase production on a laboratory scale was studied with submerged fermentations of the cellulotytic fungus Trichoderma. Consistent and reproducible high quaity enzyme yields make it possible to evaluate the conversion of waste cellulose to ethanol. DOE

N81-30597# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 7: SITE INVESTIGATION: DEEP DRILLING Final Report
Apr. 1981 250 p refs Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-7; DOE/ET-5047/7) Avail: NTIS HC A11/MF A01

The results of the deep drilling program performed on the Sunshine Site from January to August 1979 are presented. The work included continuous core drilling and sampling of the Sykesville to a vertical depth of 2556 ft, in hole geophysical logging, determination of rock permeability and stresses, and rock testing. DOE

N81-30598# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 8: DESIGN APPROACHES: UPH. APPENDIX A: UPPER RESERVOIR Final Report
Apr. 1981 91 p Prepared in cooperation with Potomac Electric Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-8-App-A; DOE/ET-5407/8A) Avail: NTIS HC A05/MF A01

Overriding considerations including operating range, volume and lining of reservoir, embankment design, intake/outlet arrangements and filling and make up water provisions were studied within the context of minimizing facility costs and optimizing the plant layout. The study led to the selection of a reservoir formed by embankment of compacted rockfill together with an intake/outlet structure located in the embankment. The reservoir floor and upstream slopes of the embankment will have an asphalt lining to prevent leakage. The material and cost estimates presented are based on the requirements for a 2000 MW plant providing 20,000 MWh of storage with a nominal head of 4600 ft. DOE

N81-30599# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 8: DESIGN APPROACHES: UPH. APPENDIX C: HEAVY HOIST Final Report
Apr. 1981 157 p Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-8-App-C; DOE/ET-5047/8C) Avail: NTIS HC A08/MF A01

Overriding considerations, including type of hoist, capacity limitations, operating speed, haulage ropes, guides, conveyance, and landings were studied within the context both of feasibility and of minimizing equipment costs. The study led to the selection of a twin drum, twin electric drive hoist, and for depths as much as 5000 ft, hoist capacities of up to 300 tons were found to be feasible. A brief reference is made to the requirements for hoisting equipment other than for heavy loads. DOE

N81-30600# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 8: DESIGN APPROACHES. UPH. APPENDIX E: LOWER RESERVOIR Final Report
Apr. 1981 157 p refs Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-8-App-E; DOE/ET-5047/8E) Avail: NTIS HC A08/MF A01

Operational, construction, and geotechnical requirements were examined. Overriding considerations including operating range, volume, construction methods, cavern cross section and reservoir layout were studied within the context of minimizing facility costs and optimizing the plant layout. The study led to a preliminary arrangement of fourteen parallel caverns, each 60 ft wide by 85 ft high in cross section and 3610 ft in length. The requirements for and preliminary design of the intermediate reservoir in the case of a two step UPH facility is also described. The design and the cost estimates presented are based on the requirements for a 2000 MW plant providing 20,000 MWh of storage at a nominal head of 4600 ft. DOE

N81-30601# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 9: DESIGN APPROACHES. CAES. APPENDIX B: CHAMPAGNE EFFECT Final Report
Apr. 1981 126 p refs Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-20013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-9-App-B; DOE/ET-5047/9B) Avail: NTIS HC A07/MF A01

The significance of the release of dissolved air from the water in the water shaft during air compression on the design and operation of a hydrolically compensated CAES plant was investigated. This air release phenomena was named the Champagne Effect. Included is a description of the work to investigate the rate of diffusion of air into water, the rate of the subsequent release of air from the water during passage up the water shaft, and an evaluation of the resulting behavior of the air bubbles in the shaft. Also included is a discussion of dynamic modeling. Simulation was based upon a two fluid model of the PEPCO system and includes an analysis of potential modifications to the design that might further mitigate any operation problems. DOE

N81-30602# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 9: DESIGN APPROACHES. CAES. APPPENDIX E: ELECTRICAL SYSTEMS Final Report
Apr. 1981 149 p Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Inst.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-9-App-E; DOE/ET-5047/9E) Avail: NTIS HC A07/MF A01

The design approaches provided the basis for development

of the preliminary plant design. The electrical systems described include the plant power system, switchyard and electrical motor starting system. The design approaches presented are based on the design criteria presented in the Project Design criteria - CAES. Selection of the preferred approach reflect the Task 3 study results and conform to the greatest extent possible with PEPCO's standard practices. DOE

N81-30603# Nuclear Utility Services, Inc., Rockville, Md.
PRELIMINARY DESIGN STUDIES OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 10: ENVIRONMENTAL STUDIES Final Report
Apr. 1981 351 p refs Prepared in cooperation with Acres American, Inc., Buffalo, N.Y. Sponsored in part by Electric Power Research Inst. and Potomac Electric Power Co., Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-10; DOT/ET-5047/10) Avail: NTIS HC A16/MF A01

Results of preliminary environmental assessments for a proposed UPH or CAES demonstration facility are presented. Included are characterizations of the existing environment of the sunshine site in Montgomery County, Maryland, and assessments of environmental impacts and public safety concerns. Elements of the existing environment which are considered sensitive are described. Environmental impacts are identified, rated, and described for both alternative demonstration facilities. Public safety concerns for both alternative demonstration facilities are also identified and discussed. These include, for both UPH and CAES, underground cavern collapse and surface subsidence, explosives, site security, icing, upper reservoir failure, and mechanical failure of plant equipment. In addition, fuel handling and the champagne effect are addressed for CAES. DOE

N81-30604# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 13: CAUPH PRELIMINARY LICENSING DOCUMENTATION Final Report
Apr. 1981 187 p refs Prepared in cooperation with Potomac Electric Power Co., Washington, D.C. Sponsored in part by Electric Power Research Corp.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(EPRI-EM-1589-Vol-13; DOE/ET-5047/13) Avail: NTIS HC A09/MF A01

An implementation plan and schedule was developed for the period from project authorization by the sponsor through receipt of all required regulatory authorizations. The documentation is based upon review of all pertinent regulations on the federal, state and local level of government, review of other publications, acquisition of applicable guides and forms, and discussions with responsible agency representatives. The implementation plan is specific to the requirements within the State of Maryland: the plan is based primarily upon the state's siting procedure which provides coordinated state agency approvals. Notwithstanding the site specific nature of the plan, many of the regulatory requirements, as well as the approach to implementation, should be suitable for general reference in developing licensing plans for CAES or UPH facilities. DOE

N81-30605# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
PERFORMANCE MATCHING AND PREDICTION FOR SERRAZZANO GEOTHERMAL RESERVOIR BY MEANS OF NUMERICAL SIMULATION
K. Pruess, O. Weres, R. Schroeder, R. Marconcini (ENEL, Firenze), and G. Neri (ENEL, Firenze) Oct. 1980 51 p refs Presented at the 2nd, DOE-ENEL Workshop for Cooperative Res. in Geothermal Energy, Berkeley, Calif., 20-24 Oct. 1980
(Contract W-7405-eng-48)
(LBL-12174; CONF-801098-2) Avail: NTIS HC A04/MF A01

The simulator SHAFT79 was applied to field wide distributed parameter simulation of the vapor dominated geothermal reservoir at Serrazzano, Italy. Using a three dimensional geologically accurate mesh and detailed flow rate data from 19 producing wells, a period of 15.5 years was simulated. The reservoir model used is based on field measurements of temperatures and pressures, laboratory data for core samples, and available geological and hydrological information. The main parameters determined during development of the simulation are permeabilities and much of the initial conditions. DOE

N81-30606# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
LOW-COST ACTIVELY-COOLED LINEAR PHOTOVOLTAIC RECEIVER
N. F. Shepard, Jr. 1981 20 p refs Presented at the 15th IEEE Photovoltaic Specialists Conf., Orlando, Fla., 11-15 May 1981 Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(SAND-81-7113C; CONF-810526-14) Avail: NTIS HC A02/MF A01

The design concept, which employs a pair of nested glass tubes, offers the potential for low-cost production through reduced material content and design simplicity. A specially configured borosilicate glass tube functions as the mounting surface for the solar cell circuit in this dual focus receiver geometry. This inner tube, which is capped at each end to provide an interior dead air space, is inserted within a 2 inch ID glass pipe which is part of the Corning Pyrex beaded pressure process piping system. The selected receiver coolant, which is designated as Synfluid (2 centistokes kinematic viscosity), is circulated through the outer glass pipe in direct contact with the solar cell circuit active area. The concentrated irradiance from the parabolic trough impinges on the outer glass pipe and is optically transmitted through the clear synthetic mineral oil to the solar cell circuit. DOE

N81-30607# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE SUMMARY OF THE BALCOMB SOLAR HOME
J. Douglas Balcomb, James C. Hedstrom, and Joseph E. Perry, Jr. 1981 6 p refs Presented at the Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26-30 May 1981
(Contract W-7405-eng-36)
(LA-UR-81-1039; CONF-810509-34) Avail: NTIS HC A02/MF A01

The heating performance of the Balcomb passive solar home was evaluated based on detailed review of 85 channels of data. This led to a re-analysis of 176 days of data taken over the winter of 1978-79. Auxiliary heat during this winter was 7.4 million Btu which compares with 66.0 million Btu total heat losses from the house plus 46.4 million Btu losses from the greenhouse. Auxiliary heat predicted using the solar load ratio method was 8.1 million Btu. Solar savings were estimated as 57 million Btu. Good thermal comfort conditions were documented. Energy flows were tabulated for each month. Energy flows were tabulated for each month. Conclusions regarding detailed heat flow and storage in the house are presented. DOE

N81-30608# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LIQUID PHOTOVOLTAIC/THERMAL COLLECTORS FOR RESIDENTIAL APPLICATIONS
Susan D. Hendrie, Pattabiraman Raghuraman, and Charles Cox 1981 4 p refs Presented at the 15th IEEE PV Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/137; CONF-810526-22) Avail: NTIS HC A02/MF A01

The fabrication of a second generation, liquid photovoltaic/thermal collector is described. Results of computer simulations indicate that the collector unit, which incorporates novel cell and framing concepts, yields significnatly improved performance results over earlier units tested. Predicted performance values of 55% thermal efficiency and 11% electrical efficiency make the performance and this collector competitive with its single function solar thermal and photovoltaic counterparts. DOE

N81-30609# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPERATING EXPERIENCE WITH THE NATURAL BRIDGES NATIONAL MONUMENT PHOTOVOLTAIC POWER SYSTEM
F. John Solman and Barbara L. Grossman 1981 6 p refs

Presented at the 15th IEEE PV Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/135; CONF-810526-15) Avail: NTIS HC A02/MF A01

A 100-kW photovoltaic power system was constructed and made operational. A comparison of system simulation with actual operation was performed and good agreement was found. Conservation measures and their benefits are described. Operating experience with the system is presented, including measured component performance of the arrays, batteries, inverters, and system overhead loads. DOE

N81-30610# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CARLISLE HOUSE: AN ALL-SOLAR ELECTRIC RESIDENCE
Burt E. Nichols and Steven J. Strong (Solar Design Associates, Lincoln, Mass.) 1981 4 p Presented at the 15th IEEE PV Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/133; CONF-810526-16) Avail: NTIS HC A02/MF A01

An all solar electric house that derives most of its energy requirements from the Sun was constructed. A solar photovoltaic array on the roof produces electricity; passive solar features provide much of the space heating, thermal collectors provide domestic hot water; and energy conservation measures reduce electrical and thermal energy requirements to a minimum. The solar photovoltaic array produces dc current that is transformed to ac power in a utility interactive inverter connected to the utility service. There is no on site electric storage. The array is sized so that, on a net basis, most of the annual energy for the house comes directly from the Sun. Initial performance data are presented. DOE

N81-30611# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPERATIONAL EXPERIENCES IN LEAD-ACID BATTERIES FOR PHOTOVOLTAIC SYSTEMS
Bronwyn L. Brench 1981 6 p refs Presented at the 15th IEEE PV Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/118; CONF-810526-18) Avail: NTIS HC A02/MF A01

Photovoltaic systems which use different kinds of lead acid batteries, including units normally used for starting, lighting, and ignition (SLI) and for motive power are discussed. Four of these battery subsystems, particularly battery type versus system load, versus performance characteristics, and versus expected lifetime, are compared and analyzed. DOE

N81-30612# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PERFORMANCE CHARACTERISTICS OF SOLAR-PHOTOVOLTAIC FLYWHEEL-STORAGE SYSTEMS
P. O. Jarvinen, Bronwyn L. Brench, and Neil E. Rasmussen 1981 6 p refs Presented at the 15th IEEE Photovoltaic Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/134; CONF-810526-23) Avail: NTIS HC A02/MF A01

A solar photovoltaic energy flywheel storage and conversion system for residential applications was tested. Performance and efficiency measurements were conducted on the system, which utilizes low loss magnetic bearings, maximum power point tracking of the photovoltaic array, integrated permanent magnet motor generator, and output power conditioning sections of either the stand alone cycloconverter or utility interactive inverter type. The overall in/out electrical storage efficiency of the flywheel system was measured along with the power transfer efficiencies of the individual components and the system spin down tare losses. The system compares favorably with systems which use batteries and inverters. DOE

N81-30613# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
GROUND COUPLING AND SINGLE-BLOW THERMAL STORAGE IN A DOUBLE-ENVELOPE HOUSE
H. T. Ghaffari and R. F. Jones 1981 6 p refs Presented at the Ann. Conf of the Intern Solar Energy Soc., Philadelphia, 26 May 1981
(Contract DE-AC02-76CH-00016)
(BNL-29480; CONF-810509-29) Avail: NTIS HC A02/MF A01

The possibility of ground thermal storage and coupling in a double shell house was investigated. Temperature distribution in the ground, utilization of measured ground temperatures, and the amount of heat retrieval are assessed. One experimental model and several hypothetical models are introduced, and their affects and advantages are compared. DOE

N81-30614# Carrier Corp., Syracuse, N.Y. Energy Systems Div.
PROPERTIES OF THE CARROL SYSTEM AND A MACHINE DESIGN FOR SOLAR-POWERED, AIR COOLED, ABSORPTION SPACE COOLING Final Report, Sep. 1977 - Mar. 1979
May 1981 124 p
(Contracts DE-AC03-77CS-31587; EG-77-C-03-1587)
(DOE/CS-31587/T2) Avail: NTIS HC A06/MF A01

The name Carrol was selected as a convenient shorthand designation for a prime candidate chemical system comprising ethylene glycol-lithium bromide as an absorbent mixture with water as a refrigerant. The instrumentation, methods of handling data and numerical results from a systematic determination of Carrol property data required to design an air cooled absorption machine based on this chemical system are described. These data include saturation temperature, relative enthalpy, density, specific heat capacity, thermal conductivity, viscosity and absorber film heat transfer coefficient as functions of solution temperature and Carrol concentration over applicable ranges. For each of the major components of the absorption chiller, i.e., generator, chiller, absorber, condenser, heat exchanger, purge and controls, the report contains an assembly drawing and the principal operating characteristics of that component. DOE

N81-30615# Sandia Labs., Albuquerque, N. Mex. Advanced Energy Projects Div.
RECENT DARRIEUS VERTICAL-AXIS WIND TURBINE AERODYNAMICAL EXPERIMENTS AT SANDIA NATIONAL LABORATORIES
Paul C. Klimas 1981 8 p refs Presented at the 2nd DOE/NASA Wind Turbine Dyn. Workshop, Cleveland, 24 Feb. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1108C; CONF-810226-5) Avail: NTIS HC A02/MF A01

The aerodynamics of airfoils operating in the vertical axis wind turbine (VAWT) environment were examined. The experiments are intended to reduce VAWT cost of energy an increase system reliability. The experiments include: (1) chordwise pressure surveys; (2) circumferential blade acceleration surveys; (3) effects of blade camber; (4) pitch and offset; (5) blade blowing; and (6) use of sections designed specifically for VAWT application. DOE

N81-30616# Sandia Labs., Albuquerque, N. Mex.
ARRAY SUBSYSTEM DEVELOPMENT FOR PHOTOVOLTAIC-ARRAY FIELDS
H. N. Post and D. G. Schueler 1981 7 p refs Presented at the 15th IEEE Photovoltaic Specialist Conf., Orlando, Fla., 11-15 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1193C; CONF-810526-20) Avail: NTIS HC A02/MF A01

The array subsystems portion of a photovoltaic power system represents the major cost item in a system and typically includes the photovoltaic modules, array foundations and structures, field wiring, array installation, and system electrical protection. Array cost-efficiency tradeoffs were examined and evaluated in terms of allowable subsystem costs. In addition, cost data and installation experience for a typical intermediate-size flat panel (ground mounted) application experiment are examined with a focus on cost reduction activities. Subsystem requirements and design considerations are discussed and specific results and guidelines for low-cost array field design are presented. DOE

N81-30617# Sandia Labs., Albuquerque, N. Mex.
OVERVIEW: RECENT DEVELOPMENTS AND POTENTIAL

OF PHOTOVOLTAIC CONCENTRATING COLLECTORS
D. G. Schueler 1981 5 p refs Presented at the 15th IEEE PV Specialist Conf., Orlando, Fla., 11 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1222C; CONF-810526-19) Avail: NTIS HC A02/MF A01

Definition and development of technology for low cost photovoltaic concentrating collectors are discussed. The most promising candidate approaches are point focus an linear-focus Fresnel lens designs using silicon solar cell technology and two axis tracking. Incremental improvements in these base line designs are expected to lead to cost effective photovoltaic collector subsystems. Recent developments in photovoltaic concentrator technology with respect to its long range economic potential are reviewed. DOE

N81-30618# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
S. Weissenberger, ed., R. B. Crawford, ed., R. B. Crawford, ed., M. A. Esser, ed., P. L. Lien, ed., and K. Madsen Jun. 1981 32 p refs
(Contract W-7405-eng-48)
(UCRL-52000-81-6) Avail: NTIS HC A03/MF A01

Research programs are described, including performance results from the tandem mirror experiment for thermonuclear reactor design, tandem mirror end plugs for future fusion reactors, and compliance with the best test ban treaties. DOE

N81-30619# Oak Ridge National Lab., Tenn. Energy Div.
LINK BETWEEN TRADITIONAL PLANNING AND ENERGY MANAGEMENT
M. Schweizer 1981 13 p refs Presented at the Community Energy Planning Conf., Gatlinburg, Tenn., 21-20 Jan. 1981; sponsored by the Tennessee Chapter of the American Planning Association and Tennessee Univ.
(Contract W-7405-eng-26)
(CONF-810140-1) Avail: NTIS HC A02/MF A01

Community energy planning is the process of envisioning a desired future state of energy supply and consumption for a local area and designing the appropriate measures to implement that future. While energy planning can be distinguished from other specialized concerns, such as housing or transportation planning, there are also major similarities which bind all these elements together. These similarities and differences are discussed. Community level energy planning represents a natural extension of the comprehensive planning process. As the comprehensive plan has grown in the past to reflect new subjects of public concern such as environmental quality and economic development, so it can evolve further to address society's growing interest in energy use. DOE

N81-30620# Oak Ridge National Lab., Tenn. Energy Div.
APPROPRIATE ENERGY TECHNOLOGY FOR URBAN AREAS
W. R. Mixon 1981 9 p refs Presented at Workshop on Status of Res. and Methods of Evaluation Interaction, Gainesville, Fla., 14-16 May 1981
(Contract W-7405-eng-26)
(CONF-810565-1) Avail: NTIS HC A02/MF A01

Some of the unique characteristics of high density urban areas as they affect the potential use of energy conservation measures and more efficient and renewable energy sources are addressed. Energy related problems of urban areas are presented and the inner city is characterized as an environment with limited potential for applying conservation measures and innovative energy sources of the level of individual buildings. District heating and cooling is presented as one technology, uniquely appropriate for urban areas, that can collect thermal energy from efficient cogeneration plants, municipal incinerators, industrial processes, and renewable natural energy resources and distribute that energy throughout a community to its ultimate consumers. Through district heating, the urban communities can conserve energy and scarce fuels, improve environmental quality, and participate in achieving a more harmonious interface between humanity and the natural environment. DOE

N81-30621# National Center for Resource Recovery, Washington, D. C.
WASTE-TO-ENERGY COMPENDIUM Final Report
Apr. 1981 125 p refs Prepared in cooperation with Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho
(Contract DE-AC01-76CS-20167)
(DOE/CE-20167/05) Avail: NTIS HC A06/MF A01

A survey is made of 35 waste energy recovery projects throughout the U.S. Included are nine refuse derived fuel (RDF) production facilities, six RDF user facilities, two combined RDF production user facilities, and 18 mass burning facilities with energy recovery. Only those facilities that are fully operational or those in advanced stages of startup and shakedown are surveyed. Information is provided on processing capacities, operation and maintenance problems, equipment specifications, capital and operating costs, and the current status of each facility. In addition, process flow schematic are provided for each of the nine RDF production plants and both RDF production user plants. DOE

N81-30622# California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF THE GLOBAL ENERGY BALANCE
R. G. Ellingson and Michael C. MacCracken May 1981 9 p refs Presented at the 4th Conf. on Atmospheric Radiation, Toronto, 16-18 Jun. 1981 Prepared in cooperation with Maryland Univ., College Park
(Contract W-7405-eng-48; Grant NSF ATM-78-21872)
(UCRL-85958; CONF-810638-1) Avail: NTIS HC A02/MF A01

A self consistent energy budget of the major components of the observed Earth atmosphere system is defined. These budgets are compared to those calculated by a particular climate model, ZAM2 for the current climate. The changes of the component budget were examined as the atmospheric CO2 concentration was doubled. The interaction between the various components in a system in which a seemingly small change in the long-wave radiation balance is amplified into a relatively large change in the surface temperature is illustrated. DOE

N81-30623# Gould, Inc., Rolling Meadows, Ill. Energy Research.
DEVELOPMENT OF A TOTALLY MAINTENANCE-FREE, DEEP-DISCHARGE LEAD-ACID BATTERY FOR PHOTOVOLTAIC APPLICATIONS
Joseph Szymborski 1981 7 p Presented at the 4th DOE Battery and Electrochem. Contractor's Conf., Washington, D.C., 2 Jun. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-7119C; CONF-810642-2) Avail: NTIS HC A02/MF A01

Progress in the development, design, fabrication and testing of 6-volt, 100 ampere-hour totally maintenance-free lead-acid batteries for photovoltaic applications is reported. Totally maintenance-free sealed operation is achieved by designing the cells so that only oxygen is generated on charge. The electrodes in the cell are separated by a highly porous material which allows the oxygen access to the negative electrode where it is reduced. There is no loss of gas from the cell and the oxygen recombination rate is high enough of efficiently reduce the oxygen at internal pressures slightly above atmospheric. This allows inexpensive prismatic components and containers to be used which are easily adaptable to a wide range of ampere-hour sizes. DOE

N81-30624# Exxon Research and Engineering Co., Linden, N.J. Advanced Energy Systems Labs.
RECENT TECHNOLOGY IMPROVEMENTS IN EXXON'S CIRCULATING ZINC-BROMINE BATTERY SYSTEM
Richard J. Bellows 1981 23 p Presented at the 4th DOE Battery and Electrochem. Contractor's Conf., Washington, D.C., 2 Jun. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-7116C; CONF-810642-1) Avail: NTIS HC A02/MF A01

Electrode and electrolyte performance on 500 wH and 3 kWh units were studied. It was indicated that Exxon's circulating zinc-bromine battery in 20 kWh designs is capable of high energy

density and turn around efficiency. The performance, coupled with factory cost projections of $28/kWh, makes zinc-bromine an attractive advanced battery candidate for not only photovoltaic, but also electric vehicle and bulk energy storage applications. DOF

N81-30625# Exxon Research and Engineering Co., Linden, N.J. Advanced Energy Systems Labs.

RECENT PROGRESS ON EXXON'S CIRCULATING ZINC-BROMINE BATTERY SYSTEM

Richard J. Bellows 1981 19 p Presented at the 4th DOE Battery and Electrochem. Contractor's Conf., Washington, D.C., 2 Jun. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-7115C; CONF-810642-4) Avail: NTIS HC A02/MF A01

The design, performance, and factory cost of Exxon's circulating zinc bromine batteries are described. The Exxon system has demonstrated stable performance in scaleups to 3 and 10 kWh sub modules. Cost studies based on recently demonstrated extrusion and injection molding techniques, show that this battery, with plastic electrodes, bipolar stacks, Br2 complexation, and circulating electrolytes, can be produced at a factory cost of $28/kWh. DOF

N81-30626# California Univ., Livermore. Lawrence Livermore Lab.

SAFETY OF ISOTROPIC FLYWHEELS

Martin W. Schwartz 30 Apr. 1981 11 p refs Presented to the 5th Intern. Conf. on Fracture ICF5, Cannes, France, 29 Mar. - 30 Apr. 1981 Submitted for publication

(Contract W-7405-eng-48)

(UCRL-84347; CONF-810373-1) Avail: NTIS HC A02/MF A01

A probabilistic safety criterion for isotropic flywheel rotors based on the tolerated noncontainment failures rates of commercial aircraft turbojet engine rotors was established. A technique is developed combining reliability with fracture mechanics. A sample calculation is provided to show the energy storage levels that isotropic flywheel rotors could achieve within the constraints of this safety criterion. DOE

N81-30627# Public Technology, Inc., Washington, D. C.

STATUS REPORT ON ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE: TECHNOLOGIES, LESSONS AND ISSUES. INFORMATION BULLETIN OF THE ENERGY TASK FORCE OF THE URBAN CONSORTIUM

1980 62 p refs

(Contract DE-FG02-78IR-05106)

(DOE/IR-05106/T6) Avail: NTIS HC A04/MF A01

Focus is on technologies and issues significant to currently operating energy recovery systems in the US - waterwall incineration, modular incineration, refuse derived fuels systems, landfill gas recovery systems. Some basic conclusions are presented concerning the state of the art of energy from waste. Plants in shakedown or under construction, along with technologies in the development stages, are briefly described. Sources of additional information and a bibliography are included. DOE

N81-30628# Commission of the European Communities, Brussels (Belgium).

SOLAR ENERGY R + D PROGRAMME, 1979-1983. PROJECT F: SOLAR RADIATION DATA

1981 283 p Presented at the 1st Coordination Meeting of Contractors, Julich, West Germany, 5-6 May 1980

(EUR-7011-EN; CONF-8005166) Avail: NTIS HC A13/MF A01

Progress on solar radiation data is reported. The following areas are discussed: production of test reference years for model simulation of solar systems and components; global radiation atlas for horizontal surfaces; radiation data on inclined surfaces; intensity thresholds and cumulative frequency curves; useful energy output from solar collectors; network comparison of pyranometers; measurements of turbidity, spectral radiation, and satellite data. DOE

N81-30629# Oak Ridge National Lab., Tenn. Solar and Special Studies Section.

EXPERIENCE FROM DOE PHOTOVOLTAIC GRANT PROJECTS

S. I. Kaplan 1981 8 p refs Presented at the Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26-30 May 1981

(Contract W-7405-eng-26)

(CONF-810509-38) Avail: NTIS HC A02/MF A01

Two large solar photovoltaic (PV) energy systems are scheduled for operation. Although both are located at 2 year colleges in the south central U.S. and are of roughly comparable output capability, their configuration and operating objectives differ considerably. The systems are described and significant items of experience during their design, construction, testing and operation are chronicled. DOE

N81-30630# Department of Energy, Washington, D. C. Office of Industrial Programs.

INDUSTRIAL ENERGY-EFFICIENCY IMPROVEMENT PROGRAM Annual Report to the Congress and the President, 1979

1 Dec. 1980 83 p

(DOE/CE-0001) Avail: NTIS HC A05/MF A01

The industrial energy efficiency improvement program to accelerate market penetration of new and emerging industrial technologies is described. Practices which will improve energy efficiency, encourage substitution of more plentiful domestic fuels, and enhance recovery of energy and materials from industrial waste streams are enumerated. Specific reports from the chemicals and allied products; primary metals, petroleum and coal products; stone, clay, and glass, paper and allied products; food and kindred products, fabricated metals; transportation equipment; machinery (except electrical); textile mill products; rubber and miscellaneous plastics; electrical and electronic equipment; lumber and wood; and tobacco products are discussed. A summary on progress in the utilization of recovered materials, and an analysis of industrial fuel mix is presented. DOE

N81-30631# Los Alamos Scientific Lab., N. Mex.

CHARACTERIZATION OF HOT DRY ROCK GEOTHERMAL ENERGY EXTRACTION SYSTEMS

James N. Albright and Carl A. Newton 1981 7 p refs Presented at the SQUID Applications to Geophys. Workshop, Los Alamos, N. Mex., 2-4 Jun. 1980

(Contract W-7405-eng-36)

(LA-UR-81-1620; CONF-810660-1) Avail: NTIS HC A02/MF A01

The engineering of heat exchange systems by which geothermal heat can be efficiently extracted from hot impermeable rocks is studied. The system currently under investigation at Fenton Hill, New Mexico consists of a network of large fractures created through the hydraulic pressurization of a well penetrating hot basement rocks and subsequently intersected by a second well drilled to form a flow-thru system. Cool water pumped into the fractures through one well, once heated in the reservoir, returns to the surface through the second well, is cooled, and then recirculated. While much is known about the performance parameters of the fracture network from short-term flow tests, little is understood concerning the spatial dimensions and geometrical relationship of individual fractures comprising the network. Ultimately, the success one has in estimating the long-term performance of such a system where commercialization is an issue, and in engineering future systems with optimal performance, depends on the success in characterizing the flow-thru fracture networks. DOE

N81-30632# Massachusetts Inst. of Tech., Cambridge.

RETROFITTING RESIDENCES WITH PHOTOVOLTAIC/THERMAL COLLECTOR SYSTEMS

Duncan B. Sheldon and Susan M. Frank 1981 5 p refs Presented at the 16th Intersoc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug. 1981

(Contract DE-AC02-76ET-20279)

(DOE/ET-20279/131; CONF-810812-5) Avail: NTIS HC A02/MF A01

Photovoltaic/thermal collector areas as low as 10 sq m are favorably matched to the operation of a conventional warm air heating system. The performances of three combined collector heating systems which are designed to operate primarily in the boosting mode were simulated. Comparison of the annual

performances of these systems determines which components should be included in a retrofit system. Additional components such as a thermal storage tank and a heat pump are considered. DOE

N81-30633# Oak Ridge National Lab., Tenn. Engineering Technology Div.
VACUUM DEAERATION FOR OCEAN THERMAL-ENERGY-CONVERSION OPEN-CYCLE APPLICATIONS
A. Golshani and F. C. Chen 1981 21 p refs Presented at the IASTED Energy Symp., San Francisco, 20-22 May 1981
(Contract W-7405-eng-26)
(CONF-810574-1) Avail: NTIS HC A02/MF A01

If the noncondensable dissolved air is not removed from a power system, it will accumulate in the condenser, reduce the effectiveness of condensation, and result in deterioration of system performance. A gas desorption study was initiated with the goal of mitigating these effects. The vacuum deaeration process for low-temperature Ocean Thermal Energy Conversion conditions where conventional steam stripping deaeration may not be applicable is discussed. Studies were carried out on: (1) vacuum deaeration in a packed column; and (2) deaeration in the barometric leg of the intake system. The design of a gas desorption test loop and a barometric intake system are described, the results of vacuum deaeration in a packed column and a barometric intake system are presented, and the saving that can be achieved when the packed column is combined with the barometric system is discussed. DOE

N81-30634# Sandia Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC-SYSTEM DEVELOPMENT STATUS
Gary J. Jones 1981 5 p refs Presented at the Ann. Conf. of the Intern. Solar Energy Soc., Philadelphia, 26 May 1981
(Contract DE-AC04-76DP-00789)
(CONF-810509-37) Avail: NTIS HC A02/MF A01

Existent price and performance goals for photovoltaic applications are discussed. Specific attention is given to efforts to reduce present costs, especially for the nonphotovoltaic system elements such as power processing, field installation, and systems engineering. The impact of the efficiency of dc to ac conversion is also discussed. E.A.K.

N81-30635# Maryland Univ., College Park.
REVIEW OF NATIONAL TECHNO-ECONOMIC ENERGY MODELS WITH PARTICULAR REFERENCE TO THE EVALUATION OF ENERGY STORAGE CONSIDERATIONS
William B. Widhelm and Thomas H. Doyle Dec. 1980 404 p refs
(Contracts DE-FG01-79ET-2685; DE-AS05-77ET-26940)
(DOE/ET-26940/T1; BN-964) Avail: NTIS HC A18/MF A01

Economic considerations used in developing National Techno-Economic (NTEE) models are presented. Methods for comparing NTEE models are discussed; specific NTEE models are described; and possible uses of NTEE models in energy storage studies are examined. DOE

N81-30636# Argonne National Lab., Ill.
HEAT-TRANSFER MODELING AND THERMAL MANAGEMENT OF BATTERIES
N. P. Yao 1980 12 p refs Presented at the 89th Natl. Meeting of the Am. Inst. of Chem. Engr., Portland, Oreg., 17-20 Aug. 1980
(Contract W-31-109-eng-38)
(CONF-800802-27) Avail: NTIS HC A02/MF A01

Thermal behavior of the battery and its thermal management, an important operational problem which would directly affect life cycle, safety, and also the cost of the batter were examined. Two commercial applications for secondary batteries, i.e., electric vehicles and electric utility load leveling, are discussed. Thermal management problems unique to various battery systems are reviewed. An example of engineering modeling which provides methodology for analysis of and engineering solutions to the battery thermal problem is presented. DOE

N81-30637# Oak Ridge National Lab., Tenn. Energy Div.
COMMUNITY-BASED ASSESSMENT AND PLANNING OF ENERGY FUTURES
Sam A. Carnes 1981 17 p refs Presented at the Community Energy Planning Conf., Gatlinburg, Tenn., 29-30 Jan. 1981; sponsored by the Tennessee Chapter of the American Planning Association and Tennessee Univ.
(Contract W-7405-eng-26)
(CONF-810140-2) Avail: NTIS HC A02/MF A01

The decentralized solar energy technology assessment program is discussed. Four communities were involved in an assessment of the compatibility of diverse conservation and renewable energy supply technologies and community values and goals and in community planning for the implementation of compatible energy demand and supply alternatives. The community approach has several basic components: (1) recruiting and organizing for the assessment planning process; (2) collection and analysis of data related to community energy use and indigenous renewable energy resources; (3) creation and maintenance of a community education and information program; (4) development of policies favorable to the development of preferred community futures; and (5) development of implementation or action strategies. The role of public participation, group decision making techniques, the role of technical information in citizen and group decision making, and linkage between assessment planning and the relevant policy process are emphasized. DOE

N81-30638# Battelle Columbus Labs., Ohio.
TECHNOLOGY FOR THE DEVELOPMENT OF HIGH EFFICIENCY OIL-FIRED RESIDENTIAL HEATING EQUIPMENT Final Report
D. W. Locklin and H. R. Hazard Jun. 1980 264 p refs B0066127 Prepared for Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(BNL-51325) Avail: NTIS HC A12/MF A01

The development of efficient residential oil burning equipment with capability for reliable, low capacity operation is assessed. Technical approaches with potential application to unconventional types of oil burners and to efficient heat exchangers, including those that operate partially in the mode of condensing moisture from the flue gases to regain the latent heat of vaporization are reviewed. The following concepts are recommended for further investigation in the development of efficient oil fired heating equipment: (1) modified high pressure atomizing systems; (2) alternative methods of atomization; (3) blue flame burners; (4) pulse combustion systems; and (5) condensing-type heat exchangers. DOE

N81-30639# Department of Energy, Washington, D. C. Office of Consumption Data System.
RESIDENTIAL ENERGY-CONSUMPTION SURVEY: CONSUMPTION AND EXPENDITURES. PART 1: NATIONAL DATA INCLUDING CONSERVATION
Apr. 1981 160 p refs
(DOE/EIA-0262/1) Avail: NTIS HC A08/MF A01

The results of the second residential energy consumption survey are presented. Data on consumption and expenditures are presented for the year April 1979 through March 1980. Tables are also presented which indicate the cost and incidence of major insulation added to US households in 1978 and 1979. The tables are from the final data file that contains imputations for missing data and includes information from the mail questionnaires. The report contains selected tabulations for each of the four Census regions for the period 1978-1980. Included are: a summary of findings showing comparisions in residential energy consumption between the 1978 to 1979 and 1979 to 1980 time periods a description of how the survey was conducted, a statement about the limitations of the data including relative standard errors, a copy of the survey forms, and a glossary.DOE

N81-30640# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ECONOMIC ANALYSIS OF INDUSTRIAL WASTE-HEAT RECOVERY: FLUIDIZED-BED TECHNOLOGY VERSUS THREE CONVENTIONAL ALTERNATIVES
Paul J. Grogan, Harry L. Brown, Michael J. Koluch, and Bernard B. Hamel Apr. 1981 40 p refs
(Contract W-31-103-eng-38)
(ANL/CNSV/TM-66) Avail: NTIS HC A03/MF A01

The performance parameters and costs of these technologies were based upon existing information. Data on available waste

energy in industry, and the temperatures and operating sources of that energy were based upon the Industrial Plant Energy Profile (IPEP). This data base contains plant-energy information from approximately 400,000 industrial plant sites in the country. These sites represent the bulk of the nation's industrial manufacturing capacity. Based on this information, the available waste energy from each of the industrial sectors was determined by process-unit operation. Waste energy was determined as a function of plant size. Each of the competing heat-recovery technologies, both conventional and fluidized-bed, was applied to the waste streams. Energy savings and payback were determined on the bases of waste-heat source and plant size. Conventional heat exchangers showed a significant number of applications with paybacks of less than one year. DOE

N81-30641# Sandia Labs., Albuquerque, N. Mex.
DESIGN OF PHOTOVOLTAIC SYSTEMS FOR RESIDENTIAL APPLICATIONS
Gary J. Jones 1981 6 p refs Presented at the 15th IEEE PV Specialists Conf., Orlando, Fla., 11 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1241C; CONF-810526-29) Avail: NTIS HC A02/MF A01

Advantages and limitations of the potential residential photovoltaic system market and the impact of recent studies on future designs are reviewed. Typical system configurations are projected based on the existence of ideal rate structures and utility interactive operation. Sizing tradeoffs are analyzed in detail showing that systems from 3 kW/sub p/ to 10 kW/sub p/ are probable. Based on load considerations, development of 4 kW/sub p/ and 8 kW/sub p/ systems is suggested. The impact of this choice on array sizing as a function of site is discussed. DOE

N81-30642# California Univ., Livermore. Lawrence Livermore Lab.
CANADA'S NEW NATIONAL ENERGY PROGRAM ON OIL AND GAS: WHAT ARE THE MAIN PROVISIONS? WHAT ARE THE REACTIONS SO FAR?
K. K. Burr Apr. 1981 73 p refs
(Contract W-7405-eng-48)
(UCID-19052) Avail: NTIS HC A04/MF A01

The Canadian federal government announced a National Energy Program (NEP) for oil and natural gas to achieve energy self sufficiency. The program deals with two major political and economic influences in Canadian energy: provincial ownership of natural resources and 70% of foreign ownership in the Canadian petroleum industry. The objectives to achieve national energy security, create opportunities for Canadian participation, and share resource benefits among the provinces. The major provisions include: a 80% federal tax on oil and gas production; a natural gas federal excise tax; a pricing scheme which holds conventional oil prices down but gives incentives for oil sands, heavy oil, and tertiary recovery production; a gas pricing scheme which encourages substitution of gas for oil; a 25% carried interest for the government on federal leases; and a Canadianization incentives grant system which replace the depletion allowance system. DOE

N81-30643# Sandia Labs., Albuquerque, N. Mex. Experimental Systems Operation Div.
SUN-POINTING PROGRAMS AND THEIR ACCURACY
John C. Zimmerman May 1981 87 p
(Contract DE-AC04-76DP-00789)
(SAND-81-0761) Avail: NTIS HC A05/MF A01

Sun pointing programs and their accuracy are described. FORTRAN program listings are given. Program descriptions are given for both Hewlett-Packard (HP-67) and Texas Instruments (TI-59) hand-held calculators. DOE

N81-30644# California Univ., Livermore. Lawrence Livermore Lab.
GEOTHERMAL INJECTION MONITORING PROJECT
L. Younker, P. Kasameyer, A. Smith, E. Didwall, J. Hanson, D. Helm, W. Murray, and J. Hearst Apr. 1981 52 p refs
(Contract W-7405-eng-48)
(UCID-19066) Avail: NTIS HC A04/MF A01

Background information is provided on the geothermal brine injection problem and each of the project tasks is outlined in detail. These tasks are evaluation of methods of monitoring the movement of injected fluid, preparation for an eventual field experiment, and a review of groundwater regulations and injection programs. DOE

N81-30645# New Mexico Univ., Albuquerque. Engineering Research Inst.
AUTOMATIC-CONTROL-ALGORITHM EFFECTS ON ENERGY PRODUCTION
Gerald M. McNerney 1981 9 p ref Presented at the DOE/NASA Wind Turbine Dyn. Workshop, Cleveland, 24 Feb. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1107C; CONF-810226-6) Avail: NTIS HC A02/MF A01

Algorithm control strategy for unattended wind turbine operation, a potentially important aspect of wind energy production is discussed. A computer model was developed using actual wind time series and turbine performance data to simulate the power produced by the Sandia 17-m VAWT operating in automatic control. The model was used to investigate the influence of starting algorithms on annual energy production. The results indicate that, depending on turbine and local wind characteristics, a bad choice of a control algorithm can significantly reduce overall energy production. The model can be used to select control algorithms and threshold parameters that maximize long term energy production. DOE

N81-30646# Varta Batterie A.G., Kelkheim (West Germany). Forschungs- und Entwicklungszentrum.
DEVELOPMENT OF A MODULARIZED BATTERY [ENTWICKLUNG EINER MODULAREN BATTERIE]
Hans K. Koethe Bonn Bundesministerium fuer Forschung und Technologie 22 Feb. 1980 104 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC A06/MF A01

A battery module delivering 50 Ah at 50 V was developed capable of withstanding the mechanical and thermal loads encountered in space missions. This module is composed of an appropriate number of individual, hermetically-sealed nickel-cadmium cells fixed in a specially designed aluminium frame. Tests show that it can withstand the vibration, shock and acceleration conditions typical of the ARIANE launcher. The temperature evolution during operation in a geostationary orbit can also be adequately controlled. Author (ESA)

N81-30647# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Zentralabteilung Technikum.
COMPARATIVE INVESTIGATIONS OF THE PERFORMANCE OF SMALL WIND ENERGY CONVERSION SYSTEMS
S. Fries, D. Borchers, and G. Petersen 1980 28 p Presented at UN/ECE Seminar on Technol. Related to New Energy Sources, Juelich, West Germany, 8-12 Dec. 1980
(GKSS-80-E-54) Avail: NTIS HC A03/MF A01

A full scale, two year test program is described for nine different 10 KW windmills at a site on the north Frisian island of Pellworm. The power plants include horizontal axis machines with two or three rotor blades (with or without blade pitch control), horizontal axis multiblade (16-to 18 blades) machines, and vertical axis machines. Electric power output, energy production, the ac frequency, the revolutions-per-minute of the converter, and the yaw angle for each horizontal axis machine are measured continuously. Wind speed, wind direction, air temperature, humidity, air pressure, and solar insolation and additional meteorological parameters for the description of climatic conditions on the site are monitored. Microprocessors are used for data processing and to control load resistances. The measurement of electric and nonelectric variables is described. Author (ESA)

N81-30648# Research Inst. of National Defence, Stockholm (Sweden).
FACTOR DEMAND IN SWEDISH MANUFACTURING INDUSTRY WITH SPECIAL REFERENCE TO THE DEMAND FOR ENERGY. INSTANTANEOUS ADJUSTMENT MODELS; SOME RESULTS
Kent Rune Sjoeholm Feb. 1981 141 p refs
(FOA-C-10175-M5) Avail: NTIS HC A07/MF A01

The dual approach to the theory of production is used to estimate factor demand functions of the Swedish manufacturing industry. Two approximations of the cost function, the translog and the generalized Leontief models, are used. The price elasticities of the factor demand do not seem to depend on the choice of model. This is at least true as to the sign pattern and as to the inputs capital, labor, total energy and other materials. Total energy is separated into solid fuels, gasoline, fuel oil, electricity and a residual. Fuel oil and electricity are found to be substitutes by both models. Capital and energy are shown to be substitutes. This implies that Swedish industry will save more energy if the capital cost can be reduced. Both models are, in the best versions, able to detect an inappropriate variable. The assumption of perfect competition on the product market, is shown to be inadequate by both models. When this assumption is relaxed, the normal substitution pattern among the inputs is resumed. Author (ESA)

N81-30649# State Univ. of New York at Albany. Atmospheric Sciences Research Center.
SOLAR DEMONSTRATION PROJECT IN A FAST-FOOD RESTAURANT
Donald McClenahan Nov. 1980 130 p refs Sponsored by New York State Energy Research and Development Authority
(PB81-196545; NYERDA-80-20) Avail: NTIS HC A07/MF A01 CSCL 13A

The results of a two-phase program in which the first phase included the successful use of heat reclamation equipment and energy conservation techniques at a typical fast-food restaurant are described. The project's second phase involved the engineering, designing, installation and interfacing of a solar collector system at the facility. The report will help to serve as a guide for other restaurants around the state, and possibly the nation, which wish to install energy saving systems, or adopt energy-saving techniques, geared to their special needs and equipment. GRA

N81-30650# Polytechnic Inst. of New York, Brooklyn
HYDROPOWER UTILIZATION IN NEW YORK STATE Final Report
Rubin S. Brown and Alvin S. Goodman Sep. 1980 93 p
(PB81-194219; NYSERDA-80-10) Avail: NTIS HC A05/MF A01 CSCL 10B

A master inventory of hydropower sites in New York is reported. It includes: data on site identification, potential capacity, initial cost, cost per kWh and category class for development. Background information on the methodologies used to structure the inventory of hydropower sites and to rank selected site entries by development categories. An explanation of the economic assessment utilized in these projects is included. GRA

N81-30651# Rhode Island Univ., Kingston.
WATER, ENERGY, AND ECONOMIC DEVELOPMENT TOWARDS AN INTEGRATED REGIONAL POLICY ANALYSIS SYSTEM
Rudolph W. Hardy Feb. 1981 63 p refs Sponsored by Dept. of Interior
(PB81-184111; W81-02430; OWRT-C-90071; G/C-00191; G(9412)(1)) Avail: NTIS HC A04/MF A01 CSCL 10A

An integrated methodological approach in the economic development of water resources and preservation and energy production and consumption was examined. The implications are explored, and potential solutions are sought. It is concluded that the nature of institutions and how they function require highly compartmentalized decision making/planning, and incentives for coordination appear weak. GRA

N81-30652# Polytechnic Inst. of New York, Brooklyn. Dept. of Civil and Environmental Engineering.
HYDROPOWER POTENTIAL OF THE NEW YORK STATE BARGE CANAL
Alvin S. Goodman and Rubin S. Brown New York New York State Energy Research and Development Authority Sep. 1980 124 p refs Sponsored by New York State Energy Research and Development Authority
(PB81-182347; NYSERDA-80-25) Avail: NTIS HC A06/MF A01 CSCL 10B

The physical characteristics of the canal system as it relates to hydropower development were studied. The hydropower potential of the canal system was determined, including an inventory of existing and proposed hydropower plants. The remaining unrealized potential of the canal system was evaluated. Various sites were selected for further investigation on the basis of the unrealized potential of the barge canal system. Preliminary estimates of the engineering and economic feasibility of developing hydropower at these sites were also studied. GRA

N81-30653# Virginia Polytechnic Inst. and State Univ., Blacksburg.
EFFECTS OF TEST FLUID COMPOSITION AND FLOW RATES ON THE THERMAL EFFICIENCY OF SOLAR COLLECTORS Final Report
William C. Thomas Aug. 1980 93 p refs Sponsored in part by NBS and DOE
(PB81-180267; NBS-GCR-80-254; VPI-SU-80-03) Avail: NTIS HC A05/MF A01 CSCL 13A

Experimental and analytical investigations were carried out to determine the significance of the heat transfer fluid and mass flow rate on the thermal performance of two liquid heating flat plate solar collectors. The collector thermal performance was lowered significantly for high concentrations of glycol and mineral base oil. GRA

N81-30654# Pratt Inst., Brooklyn, N. Y.
ENERGY CONSERVATION POTENTIAL IN LOW-RISE, HIGH-DENSITY HOUSING Final Report, Sep. 1979 - Sep. 1980
Ron DiDonno New York New York State Energy Research and Development Authority Sep. 1980 221 p Sponsored by New York State Energy Research and Development Authority
(PB81-194664; NYSERDA-80-9) Avail: NTIS HC A10/MF A01 CSCL 13A

Results of a year-long study of energy consumption in New York Housing Authority projects and of the design analysis for row house type buildings are reported. Computer simulations and economic analyses were made of 113 design options, and the most cost effective and energy efficient options were selected. GRA

N81-30655# Design Alternatives, Inc., Washington, D. C.
PLANNING LOCAL SOLAR PROJECTS
1981 66 p
(Contract CSA-D9AF-009)
(PB81-197014) Avail: NTIS HC A04/MF A01 CSCL 13A

A handbook which is used as an aid in local solar project development is presented. The purpose of this guidebook is to serve as a guide in the development, implementation, and evaluation of a local solar project. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N81-30656 Institut d'Aeronomie Spatiale de Belgique, Brussels.
ATMOSPHERIC NITRIC ACID AND CHLOROFLUOROMETHANE 11 FROM INTERFEROMETRIC SPECTRA OBTAINED AT THE OBSERVATOIRE DU PIC DU MIDI
C. Lippens and C. Muller 1980 31 p refs Submitted for publication
(Aeronomica-Acta-A-227-1980) Avail: Issuing Activity

A modified interferometer was used to obtain absorption spectra and emission spectra (reduced from the difference between the reference spectrum and transformed emission data). The data obtained lead to a value of 12 billion mol/cu cm nitric acid at an altitude of 22km; chlorofluoromethane 11 is found in the troposphere at 148 + or - 12ppt. No evidence of peroxy nitric acid, nitrous acid or ammonia was observed. The difficulties in observing hydrogen peroxide and obtaining accurate values for ozone and chlorofluoromethane 12 are discussed. The integrated peroxynitric acid column is found to be smaller than 10 to the 15th power mol/sq cm. Author (ESA)

N81-30657*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA GLOBAL ATMOSPHERIC SAMPLING PROGRAM (GASP) DATA REPORT FOR TAPE VL0015, VL0016, VL0017, VL0018, VL0019, AND VL0020

Leonidas C. Papthakos and Daniel Briehl Jun. 1981 95 p refs

(NASA-TM-81661; E-679) Avail: NTIS HC A05/MF A01 CSCL 13B

This is the twelfth of a series of reports which describes the data currently available from GASP, including flight routes and dates, instrumentation, data processing procedures, and data tape specifications. In-situ measurements of atmospheric ozone, cabin ozone, carbon monoxide, water vapor, particles, clouds, condensation nuclei, filter samples and related meteorological and flight information obtained during 1732 flights of aircraft N533PA, N4711U, N655PA, and VH-EBE from January 5, 1978 through October 9, 1978 are reported. These data are now available from the National Climatic Center, Asheville, NC, 22801. In addition to the GASP data, tropopause pressures obtained from time ans space interpolation of National Meteorological Center archived data for the dates of the flights are included. Author

N81-30658# Air Weather Service, Scott AFB, Ill.

CALCULATING TOXIC CORRIDORS

Jon P. Kahler, Robert G. Curry, and Raymond A. Kandler Nov. 1980 104 p refs

(AD-A101267; AD-E850059; AWS-TR-80-003) Avail: NTIS HC A06/MF A01 CSCL 13/2

Method for defining evacuation areas for accidental spills of toxic chemicals are presented. These spills can present serious health hazards to people exposed to excessive vapor concentrations downwind of the accident. An empirical diffusion equation is used to calculate the downwind hazard distance. The width of the toxic corridor specified in angular degrees centered along the mean wind direction is based upon the variability of the wind direction. Flexibility in estimating toxic corridor evacuation areas is allowed through a choice of four different methods involving the use of tables, nomograms, and a programmable calculator. Appendices present worksheets, example problems, procedures for determining meteorological inputs, a procedure for determining evaporative source strength, and other items. GRA

N81-30659# Army Construction Engineering Research Lab., Champaign, Ill.

COMMUNITY REACTION TO IMPULSE NOISE: INITIAL ARMY SURVEY Final Report

Paul D. Schomer Jun. 1981 172 p refs

(DA Proj. 4A7-62720-A-896)

(AD-A101674; CERL-TR-N-100) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report gives the results of a noise-impact attitudinal survey done in the Fort Bragg/Fayetteville, NC, area. It shows that to the extent normal sources like airplanes fit an energy model (such as the day/night average sound level (DNL), impulse noise also fits an energy model. The growth of annoyance levels in a community with increases of loudness occurs similarly for impulse noise and for aircraft and helicopters. The growth of annoyance in a community with increases in the frequency of occurrence of events occurs in a similar way for all noises, except that the integration period for impulse noise apparently extends down to 'once every few months', whereas annoyance all but dies away for other noises when the frequency of occurrence drops this low. All types of noise sources have roughly the same nighttime noise penalty: 7 to 10 dB. C-weighting is the best available standard measure; a C-weighted DNL (CDNL) which includes no threshold or impulse correction factor offers the best model to describe community response. To establish an equivalency between CDNL levels used to assess impulse noise and A-weighted DNL (ADNL) levels used to assess other noise, it is necessary to find a common denominator. It is recommended that the percent of the community 'highly annoyed' in a given noise climate be that common denominator. With this common denominator, about 6 dB must be added to the numerical value of the CDNL level. Author (GRA)

N81-30660# Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.

SULFUR CAPTURE IN AN ATMOSPHERIC FLUIDIZED-BED COMBUSTOR

D. M. Baars, C. A. Hunter, and E. N. Keitelman Jun. 1981 47 p refs

(Contract W-7405-eng-26)

(ORNL/MIT-322) Avail: NTIS HC A03/MF A01

Two empirical correlations correlate sulfur capture as a function of the calcium-to-sulfur mole ratio and gas residence time. Both correlations fit the experimental no-recycle results. Of the limestones tested with no recycle, Vulcan Materials exhibits the best sulfur-capture performance. Data Collected with Reed limestone indicates that recycle improves sulfur-capture compared with once-through performance. However, there is a decreasing effect on sulfur capture as the recycle rate is increased to large values. At 90% sulfur capture, the fractional reduction of fresh limestone feed attributable to recycle is 24 to 35% over a gas-residence time range of 0.7 to 0.4 s. DOE

N81-30661# Argonne National Lab., Ill. Energy and Environmental Systems Div.

IN PURSUIT OF CLEAN AIR: A DATA BOOK OF PROBLEMS AND STRATEGIES AT THE STATE LEVEL, SUPPLEMENT

D. B. Garvey, S. B. Moser, and D. G. Streets Aug. 1980 288 p refs

(Contract W-31-109-eng-38)

(ANL/EES/TM-129) Avail: NTIS HC A13/MF A01

The Clean Air Act Amendments of 1977 and EPA regulations set stringent requirements for the control of emissions in areas where the National Ambient Air Quality Standards were exceeded. A previous five volume summary of nonattainment area designations and attainment strategies of the states as of July 1, 1980 is updated. Maps of PSD Class 1 areas and additional information on coal production, coal reserves, and coal quality are also included. DOE

N81-30662# Chevron Resources Co., San Francisco, Calif.

BEOWAWE GEOTHERMAL AREA EVALUATION PROGRAM Final Report, 1 Nov. 1978 - 31 Jul. 1980

J. L. Iovenitti Mar. 1981 218 p

(Contract DE-AC08-78ET-27101)

(DOE/ET-27101/1) Avail: NTIS HC A10/MF A01

Several exploration programs were conducted at the Beowawe Geothermal Prospect, Lander and Eureka County, Nevada. A shallow temperature hole program, a mercury soil sampling survey, and a self potential survey were conducted to select the optimum site for an exploratory well. A 5927 foot exploratory well was drilled running geophysical logs. A drill stem test was conducted along with a short term flow test. Basic data collected are summarized. DOE

N81-30663# California Univ., Livermore. Lawrence Livermore Lab.

CHEMICAL ECOLOGY INVESTIGATIONS AT THE GEYSERS, CALIFORNIA

R. R. Ireland and James L. Carter Jun. 1980 5 p refs Presented at the Geothermal Resources Council Ann. Meeting, Salt Lake City, 9-11 Sep. 1980

(Contract W-7405-eng-48)

(UCRL-84507; CONF-800920-30) Avail: NTIS HC A02/MF A01

The ultimate objective of the program is to assess the long-term ecosystem effects of development-related effluents to the aquatic environment. The first phase was design to: identify partitioning transport in water and sediment of a wide range of elemental constituents, and to determine the degree of impact of geothermal development in an area where a natural background of thermal tributaries and abandoned mercury mine tailings exist. Selected constituents such as ammonia, boron, sulfate and potassium are shown to be enriched in both natural geothermal waters and in cooling tower waters and emissions. Analyses implicate geothermal units as significant contributors of aquatic input. The most probable transport process is cooling tower drift. DOE

N81-30664# California Univ., Berkeley. Lawrence Berkeley Lab.

INDOOR AIR QUALITY: POTENTIAL AUDIT STRATEGIES

Greg W. Traynor Mar. 1981 11 p refs Presented at the 8th

Ann. Energy Conservation Management Conf., Portland, Oreg., 17-18 Mar. 1981; sponsored by the Bonneville Power Administration Submitted for publication
(Contract W-7405-eng-48)
(LBL-12387; CONF-810370-1) Avail: NTIS HC A02/MF A01

Techniques for measuring CO, NO2, Formaldehyde, radon, and particulates in residential indoor air space are described. A basic indoor air quality audit is proposed comprising two steps: (1) compiling an inventory of indoor pollutant sources and assessing the amount of pollutants injected into the home from known sources, sources with a narrow range of emission rates; and (2) measuring the pollutant source strengths of unknown sources - sources with emission rates that vary widely. DOE

N81-30665# Argonne National Lab., Ill.
ENVIRONMENTAL EFFECTS OF SPACE SYSTEMS
D. M. Rote 1980 13 p refs Presented at the AIAA Intern. Meeting and Tech. Display Global Technol. 2000, Baltimore, 6-8 May 1980
(Contract W-31-109-eng-38)
(CONF-800590-2) Avail: NTIS HC A02/MF A01

The potential effects of large space systems, primarily the Satellie Power System (SPS), on the upper atmosphere, were reviewed. From 56 to 500 km, the major contaminant sources are SPS microwave transmissions and rocket effluents. Deposition of rocket effluens causes compositional changes, most of which appear to be associated with the release of large amounts of water. The formation of ionospheric holes is an example of a modification resulting from the injection of propellant exhaust in the F-region. From 500 to 36,000 km, rocket effluents and ion engine contaminants could alter magnetospheric and plasmaspheric structure and dynamics. One of the major impacts of these alterations could be perturbation of Van Allen radiation belt stability, leading to changed radiation hazards to materials and personnel. DOE

N81-30666# Illinois State Water Survey, Champaign.
SEASONAL PATTERNS OF SULFATE AND NITRATE IN PRECIPITATION IN THE UNITED STATES
1981 16 p refs Presented at the 74th Ann. Meeting of the Air Pollution Control Assoc., Philadelphia, 21 Jun. 1981
(Contract DE-AS02-76EV-01199)
(CONF-810631-2) Avail: NTIS HC A02/MF A01

Seasonal variations in precipitation SQ4, NO3, and to some extent H3O along with emissions, air quality, and meteorological parameters were investigated to gain insight into the cycles of S and N compounds in the troposphere. Results show that precipitation SQ4 and H3O were higher during the warm months than during the cold months. Only in the southeast was the pattern for NO3 similar. Results for seasonally summarized emissions, air and precipitation quality S, and meteorological parameters were intercompared to infer the importance of seasonal variations in the transformation of atmospheric S. DOE

N81-30667# Rockwell International Corp., Golden, Colo. Energy Systems Group
US DEPARTMENT OF ENERGY, ROCKY FLATS PLANT ANNUAL ENVIRONMENTAL MONITORING REPORT Progress Report, Jan. - Dec. 1980
Robert D. Howerton, ed. 20 Apr. 1981 55 p refs
(Contract DE-AC04-76DP-03533)
(RFP-ENV-80) Avail: NTIS HC A04/MF A01

Sample analyses are performed by the Health, Safety and Environmental Laboratories of the Health, Safety and Environmental Department and by the General Laboratory of the Quality Engineering and Control Department An evaluation of Plant compliance with all appropriate environmental guides, limits and standards is included. Potential public radiation dose commitments were derived from average radionuclide concentrations measured at the Plant property boundaries and in surrounding communities DOE

N81-30668# Argonne National Lab., Ill. Energy and Environmental Systems Div.
TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS: AIR-QUALITY EFFECTS OF DIRECT-SOLAR AND BIOMASS SYSTEMS IN HIGH AND LOW DEPLOYMENT SCENARIOS
L. Habegger, P. Dauzvardis, M. Snider, P. Michel, and W. Gasper Jan. 1981 85 p refs
(Contract W-31-109-eng-38)
(ANL/EES/TM-140) Avail: NTIS HC A05/MF A01

The potential benefits and damages to air quality that are related to utilization of solar and biomass technologies as alternatives to more conventional energy producing technologies are evaluated. A compilation of emission levels from various biomass technologies is included. Secondly, it evaluates and compares national and regional cumulative emissions for two solar and biomass growth scenarios in the year 2000: a low growth scenario of 6 quad; and a high growth scenario of 14.2 quad. For the high growth solar scenario, both the national sulfur dioxide and nitrogen oxide emissions were projected to be approximately 5 percent lower than for the low growth scenario. In contrast, particulate emissions were estimated to be approximately 10 percent larger for the high growth scenario, primarily due to emissions from direct combustion of forest and agricultural residues in small, poorly controlled units. Both scenarios project an increase from 1975 national levels of sulfur dioxide and nitrogen dioxide emissions, and both project a decrease from 1975 national levels of particulate emissions. Air pollutant implications of the solar and biomass scenarios for the ten federal regions are also discussed. This indicates significant regional differences in technology mix and the relation of emission changes to attainment and maintenance of air quality standards within the regions. DOE

N81-30669# Department of Energy, New York. Environmental Measurements Lab.
ATMOSPHERIC POLLUTION TRANSPORT Environmental Report, 1 Sep. 1980 - 1 Mar. 1981
Edward P. Hardy, Jr. 1 May 1981 708 p refs
(EML-390) Avail: NTIS HC A99/MF A01

Global movement of radioactive debris from nuclear tests, vertical distribution of short lived radionuclides in the lower stratosphere, stratospheric radionuclide and trace gas inventories, plutonium isotopes in stratospheric filtered air, sulfur dioxide measurements in New York City, estimates of lead, manganese, aluminum and iron in atmospheric deposition at American Samoa, chemical composition of deposition at seven US locations, intercomparisons of trace element analyses of commercially available reference materials, evaluation of analytical methods for polycyclic aromatic hydrocarbons in sediment, and quality control assessments of radionuclide analyses of surface air filters, biological and deposition samples and of chemical analyses of precipitation are discussed. DOE

N81-30670# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering and Environmental Engineering.
CHARACTERIZATION OF ACIDIC PRECIPITATION IN THE ADIRONDACK REGION Final Report
A. H. Johannes, E. R. Altwicker, and N. L. Clesceri May 1981 200 p refs Sponsord by Electric Power Research Ins.
(EPRI Proj. 1155-1)
(EPRI-EA-1826) Avail: NTIS HC A09/MF A01

Atmospheric inputs into three lake watersheds within a 30 km radius of each other in the Adirondack Park region of New York State were quantified for the period May 1978 - August 1979. This was accomplished with a wet/dry precipitation network which collected samples on an event basis. Rain and snow amounts were measured and samples were analyzed for pH, conductivity, SO4, NO3, NH4, Ca, Mg, K, and Na. Precipitation quantity and quality for the three watersheds were found to be similar on a monthly or yearly basis, but individual events occasionally showed wide fluctuation in both manners across the network. Dry deposition made significant contributions (10 to 30 percent) to the total atmospheric loading to these basins. DOE

N81-30671# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
CAPABILITIES FOR RESEARCH ON ACID RAIN
B. Manowitz May 1981 48 p refs
(BNL-29741) Avail: NTIS HC A03/MF A01

Acid rain studies conducted within the Department of Energy and Environment in the divisions of Atmospheric Sciences,

Environmental Chemistry, Land and Freshwater Environmental Sciences, and Biomedical and Environmental Assessment of the National Center for the Analysis of Energy Systems are described. The capabilities and ongoing activities of each of these organizations which relate to the acid rain problem are summarized.
DOE

N81-30672# Siam Inst. for Mathematics and Society, Philadelphia, Pa.
BROWNIAN-MOTION MODEL OF POLLUTANT-CONCENTRATION DISTRIBUTIONS. STUDY ON STATISTICS AND ENVIRONMENTAL FACTORS IN HEALTH (SIMS)
Wayne R. Ott Apr. 1981 59 p refs Prepared in cooperation with Stanford Univ., Calif. Sponsored in part by EPA, Sloan Foundation and NSF
(Contract DE-AC02-80EV-10428)
(DOE/EV-10428/11; TR-46) Avail: NTIS HC A04/MF A01

The reasons for unimodal, right skewed frequency distributions often observed in measurements of pollutants in environmental media (air, water, and solid) were studied. The distributions generated by a simple Brownian motion process were explored. Concentration is observed at a fixed location analogous to a pollutant monitoring location, and the pollutant, consisting of a finite number of particles, is released from a single point source. The trajectories of the particles are subject to the usual Brownian motion assumptions, consistent with the laws of diffusion. The probability distributions of concentrations generated by several different cases, it show right skewed unimodal distributions.DOE

N81-30673# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
MODELING POLLUTANT DISPERSION WITHIN A TORNADIC THUNDERSTORM
D. W. Pepper 1981 15 p refs Presented at the Intern. Conf. on Numerical Methods for Laminar and Turbulent Flow, Venice, 13-16 Jul. 1981
(Contract DE-AC09-76SR-00001)
(DP-MS-80-84; CONF-810702-7) Avail: NTIS HC A02/MF A01

A three dimensional numerical model to calculate ground level air concentration and deposition of particles entrained in a tornadic thunderstorm was developed. The rotational characteristics of the tornadic storm are within the larger mesoscale flow of the storm system and transported with the vortex. Turbulence exchange coefficients are based on empirical values. The quasi-Lagrangian method of moments is used to model the transport of concentration within a grid cell volume. Results indicate that updrafts and downdrafts, coupled with scavenging of particles by precipitation, account for most of the material being deposited closer to the site than anticipated. DOE

N81-30674# National Academy of Sciences - National Research Council, Washington, D. C.
CARBON DIOXIDE EFFECTS RESEARCH AND ASSESSMENT PROGRAM: FLUX OF ORGANIC CARBON BY RIVERS TO THE OCEANS
Apr. 1981 403 p refs Workshop held at Woods Hole, Mass., 21-25 Sep. 1980
(Contract DE-FG01-80EV-10335)
(CONF-8009140) Avail: NTIS HC A18/MF A01

Sources of, transport of, and methods for determining dissolved and particulate organic content in rivers, estuaries, and along coasts are investigated. For individual titles, see N81-30675 through N81-30688.

N81-30675# National Academy of Sciences - National Research Council, Washington, D. C.
STORAGE AND TRANSPORT OF CARBON BY RIVERS
In its Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 5-16 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

Qualitative and quantitative aspects of the storage and transport of dissolved organic carbon (DOT) and particulate organic carbon (POT) are discussed. Global estimates of stored carbon range from 4 trillion to 78 trillion moles C/yr stored in upstream channel and flood plain areas. The relation of river carbon fluxes to changes in ocean carbon flux following deforestation of the land and increased carbon productivity of rivers due to nutrient additions is considered. The accumulative of carbon flux from rivers in continental and coastal sediments is estimated. The global flux of total organic carbon (TOC) exported by rivers to the ocean is estimated to be 66 trillion moles C/yr. J.D.H.

N81-30676# National Academy of Sciences - National Research Council, Washington, D. C.
ROLE OF RIVER TRANSPORTED ORGANIC CARBON IN THE GLOBAL CYCLE
In its Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 16-23 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The complex balance between storage, release, and respiration (oxidation) of organic carbon in terrestrial and aquatic environments is considered. Fluxes associated with the erosion, transport, and sequestering of organic carbon in marine environments are small relative to the amounts involved in photosynthesis and respiration. The flux of eroded organic carbon from upland areas to lowland areas and into temporary storage is considered to be significant. The amount of organic carbon transported to and sequestered in marine sediments is sufficiently large that this sequestration may be an effective net sink for anthropogenic carbon dioxide. The changes in fluxes into storage areas since ancient times are considered. J.D.H.

N81-30677# Hamburg Univ. (West Germany).
RATE OF DENUDATION IN BLACK SEA SOURCE AREA
Egon T. Degens *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 36-45 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The source area for river discharges into the Black Sea is described, and the major sources of sedimentation considered. Revisions in estimates of the age of sediments brought about by the use of Holocane varve chronology and the significance of anoxic conditions during the Holocane are discussed. The increase in sedimentation after agriculture had changed the source area from forested lands into a steppe is described. J.D.H.

N81-30678# Institute of Nuclear Sciences, Lower Hutt (New Zealand).
USE OF CARBON ISOTOPE MEASUREMENTS TO EXAMINE THE MOVEMENT OF LABILE AND REFRACTORY CARBON IN SOIL
B. J. OBrien, J. D. Stout, and K. M. Goh *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 46-74 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

Carbon isotope measurements are applied to data from New Zealand to analyze the movement of carbon from plant to soil to ground water. Increases in C14 in the upper layers of soil due to the incorporation of bomb carbon are demonstrated. Use of a carbon transport diffusion model to analyze the C14 data and estimate the average annual loss, carbon turnover time, and diffusion in soils is described. Indications that the hydrolyzed fraction of the carbon in silt loam is metabolized, but the residue unmetabolized, are presented. The origins of dissolved organic carbon and particulate organic carbon are determined. J.D.H.

N81-30679# Geological Survey, Reston, Va
CARBON ISOTOPES AS INDICATORS OF THE SOURCE AND FATE OF CARBON IN RIVERS AND ESTUARIES
Elliott C. Spiker *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 75-108 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The use of C14, C13, and C12 data in the determination of the sources, sinks, and rates of biochemical processing in river-estuarine systems is described. Determination of the time carbon is fixated by photosynthesis, discrimination between terrestrial and marine organic carbon, and double isotopic labeling of carbon for the analyis of the sources and sinks of carbon are described. J.D.H.

N81-30680# Washington Univ., Seattle.
CHEMICAL INDICATORS OF ORGANIC RIVER SOURCES IN RIVERS AND ESTUARIES
John I. Hedges *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 109-141 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

Biological sources of organic carbon in rivers, estuaries, and coastal marine environments are identified. The use of molecular organic tracers is described. The percentage of carbohydrates, proteins, phenolics (primarily lignins), and lipids occurring in higher plants and in marine plankton are listed. Criteria for selection of an organic tracer are presented. Plant wax hydrocarbons, carboxylic acids, and sterols are considered as tracers. Chemical methods for identifying dissolved organic carbons are considered. J.D.H.

N81-30681# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
DEPOSITION OF RIVERBORNE ORGANIC CARBON IN FLOODPLAIN WETLANDS AND DELTAS
Patrick J. Mulholland *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 142-172 refs (For primary document see N81-30674 21-45)
(Contracts DE-AC05-76OR-00033; W-7405-eng-26)
(Publ-1669) Avail: NTIS HC A18/MF A01

Interactions between rivers and floodplain wetlands and their effect on deposition of riverborne sediment and particulate organic carbon are considered. The effect of the transfer of detrital organic carbon from upland terrestrial systems to lowland environments is described. Changes caused by human activities and agriculture are considered. J.D.H.

N81-30682# Geological Survey, Denver, Colo.
FLUX OF ORGANIC CARBON TO THE OCEANS: SOME HYDROLOGIC CONSIDERATIONS
Carl F. Nordin, Jr. and Robert H. Meade *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 173-218 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

Estimates of the flux of organic carbon to the oceans which vary by order of magnitude are discussed. Estimation of the contribution to the ocean from rivers is to measure or estimate the flux from the largest rivers. The same approach as for the flux of large rivers is used to estimate flux of organic carbon. In making estimates from such an approach certain hydrologic processes are considered. Data are collected to evaluate the impact of extreme events on the average values of annual flows or fluxes and which do arrive at figures in the determination of standard errors of estimates. E.A.K.

N81-30683# Ecole Normale Superieure, Paris (France). Lab. de Geologie.
RIVER TRANSPORT OF ORGANIC CARBON TO THE OCEAN
Michel Meybeck *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 219-269 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

Existing data on dissolved, particulate, and total carbon (DOC, POC, TOC) in rivers and their variations with time and space were studied and data to the global input of organic carbon from rivers were extrapolated. Organic carbon was analyzed in four studies: (1) monitoring of water quality in rivers in which organic carbon is an indicator of water pollution; (2) specific surveys to study origin, distribution, and fate of organic carbon in rivers; (3) carbon budget of lakes; and (4) studies of river geochemistry. E.A.K.

N81-30684# Washington Univ., Seattle. Fisheries Research Inst.
FLUXES OF ORGANIC MATTER IN RIVERS RELATIVE TO THE GLOBAL CARBON CYCLE
Jeffrey E. Richey *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 270-293 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A02/MF A01

The role of rivers in the global carbon cycle was examined. The biogeochemistry of carbon in rivers and carbon fluxes in the Amazon river are evaluated. Existing estimates on river carbon transport are reviewed. E.A.K.

N81-30685# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
FATE OF SEDIMENTED ORGANIC CARBON IN ESTUARIES
Peter J. Wangersky *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux or Org. Carbon by Rivers to the Oceans Apr. 1981 p 294-313 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The mechanisms involved in storage and remineralization in organic matter after sedimentation in estuaries are considered. The probable contribution of the sediments to the oceanic carbon cycle are estimated. Sedimentation rates in areas depend upon the season, and are estimated from derived records of sediment movements. It is suggested that more than 90% of organic materials reaching the sea floor is taken up by bottom organisms, rather than incorporated into the sediment. Indirect measurement of oxygen uptake by sediments suggest that oxidation of organic matter in newly sedimented material may be complete within a year of deposition. It is found that the estuary retains almost all of the sedimented organic carbon. E.A.K.

N81-30686# Yale Univ., New Haven, Conn.
RADIOCARBON IN NEW YORK BIGHT SEDIMENTS AND THE USE OF CARBON ISOTOPES IN DELINEATING CARBON SOURCES
Karl K. Turekian and Gaboury J. Benoit *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 314-330 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The various sources of organic carbon that led to the search for diagnostic chemical, physical, or isotopic properties of the different components were identified. One property is the carbon isotope imprint, and marine derived organic carbon and terrestrial carbon are the most obvious natural sources. The distinction between the two sources in sediments was examined. The artificial sources are oil and coal products and sewage sludge. These sources have delta C13 values close to terrestrial carbon. It is suggested that the use of delta C13 in temperature zone distinguishes an open ocean plankton source of sedimentary carbon from all other sources. E.A.K.

N81-30687# Brussels Univ. (Belgium). Lab. Oceanographie.
FATE OF TERRESTRIAL ORGANIC CARBON IN THE COASTAL AREA
Roland Wollast and Gilles Billen *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 331-359 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The behavior of dissolved and particulate organic carbon in shallow coastal areas was examined. The volume of carbon transported to coastal areas by major rivers, either oxidized, stored in sediments, or exported to the open ocean is evaluated. The mechanisms of transfer production, and removal of organic matter in the estuarine zone are discussed. The main characteristics of the carbon cycle in the coastal zone and the relative importance of riverborne organic matter in this cycle are described. E.A.K.

N81-30688# Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
GLOBAL CARBON CYCLE: SOME MINOR SINKS FOR CO2
Fred T. Mackenzie *In* NAS-NRC Carbon Dioxide Effects Res. and Assessment Program: Flux of Org. Carbon by Rivers to the Oceans Apr. 1981 p 360-384 refs (For primary document see N81-30674 21-45)
Avail: NTIS HC A18/MF A01

The role of some minor sinks in storage of CO2, produced

from fossil fuel burning and other sources, were assessed. It is noted that sinks other than the ocean and atmosphere may be responsible for storage of some CO2 produced by activities of society. The increased fluxes of carbon associated with these minor sinks are not substantial. However, a number of small sinks could play a role in alleviating what seems to be a small imbalance in the estimates of carbon cycle. E.A.K.

N81-30689# California Univ., Livermore. Lawrence Livermore Lab.
COMPARISON OF OBSERVED AND MODEL-PREDICTED O SUB 3 TRENDS
J. E. Penner 13 May 1981 10 p refs
(Contract W-7405-eng-48)
(UCID-19040) Avail: NTIS HC A02/MF A01

Model predictions for trends in atmospheric ozone concentrations are compared to the detection threshold for total O3 developed by London. DOE

N81-30690# California Univ., Berkeley. Lawrence Berkeley Lab.
ROLE OF BLACK CARBON IN THE ORGANIC CHEMISTRY OF ATMOSPHERIC AEROSOLS
L. A. Gundel, R. L. Dod, A. D. A. Hansen, H. Rosen, S-G. Chang, and T. Novakov Apr. 1981 7 p refs Presented at the Workshop on Phys. and Chem. of Energy-Related Atmospheric Pollution, Harper's Ferry, W. Va., 21-23 Apr. 1981
(Contract W-7405-eng-48)
(LBL-12540; CONF-810475-2) Avail: NTIS HC A02/MF A01

The optical absorptivity, adsorption capacity, and surface characteristics of black carbon is described. Gas chromatographic and mass spectral studies indicate that particulate organic material contains unburned and partially oxidized fuel hydrocarbons, polynuclear aromatic hydrocarbons, and polyfunctional oxygenated compounds which are formed in the atmosphere by reaction of hydrocarbons with atmospheric or pollutant gases. Thermograms of urban aerosols typically exhibit three broad peaks when evolved CO2 concentration is plotted verus heating temperature. Studies indicate that the ratios of secondary to primary carbon in urban particulate matter are similar for samples collected in Berkeley, Los Angeles, and New York City irrespective of the level of photochemical activity at the sampling sites. It is found that the fraction of black carbon to total carbon in urban carbonaceous particles is approximately constant, independent of sampling location or time of year. DOE

N81-30691# Mound Lab., Miamisburg, Ohio.
AIR QUALITY AND THE ENVIRONMENTAL EFFECTS FROM AN UNDERGROUND COAL-GASIFICATION TEST
P. W. Seabaugh, R. E. Zielinski, A. K. Agarwal, J. W. Martin (DOE, Morgantown, W. Va.), and A. J. Liberatore (DOE, Morgantown, W. Va.) 1981 9 p refs Presented at the Symp. on Instrumentation and Control for Fossil Energy Processes, San Francisco, 8 Jun. 1981
(Contract DE-AC04-76DP-00053)
(MLM-2837(OP); CONF-810607-4) Avail: NTIS HC A02/MF A01

Using fast response analytical systems and real-time data acquisition, a high density data base was acquired for 17 gaseous components of the product gas stream, including SO2, H2S, COS, and HCN. The data show that almost all gaseous sulfur from the bituminous coal was emitted as H2S. The SO2 and COS values rarely exceeded the background of the instruments although the COS values did rise to abut 100 ppM during the gasification phase. Except for one short period when values rose to 60 ppM, the HCN similarly stayed at the instrument background level of about 1 ppM. Because proven technology to clean H2S from gas streams is available, the test indicates that in-situ gasification of high sulfur bituminous coal on a commercial scale should not contribute to deterioration in air quality. DOE

N81-30692# Battelle Pacific Northwest Labs., Richland, Wash.
REVIEW OF PACIFIC NORTHWEST LABORATORY RESEARCH ON AQUATIC EFFECTS OF HYDROELECTRIC GENERATION AND ASSESSMENT OF RESEARCH NEEDS
D. H. Fickeisen, C. D. Becker, and D. A. Neitzel May 1981 32 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3816) Avail: NTIS HC A03/MF A01

The effect of hydroelectric generation on aquatic biota and environments is discussed. The research goals are to: (1) identify impacts of hydroelectric generation; (2) provide guidance in allocating scarce water resources; and (3) develop techniques to avoid or reduce the impacts on aquatic communities or to compensate for unavoidable impacts. The generic impacts of hydrogeneration is studied. The impacts studied result from a particular system of dams and operating procedures and occur within a specific ecosystem, however, the results have application at hydroelectric generating facilities throughout the United States. DOE

N81-30693# Argonne National Lab., Ill.
TRADEOFFS OF ENERGY CONSERVATION AND ENVIRONMENTAL QUALITY
Allan R. Evans 1980 6 p refs Presented at the 3rd World Energy Congr., Atlanta, 13-16 Oct. 1980
(Contract W-31-109-eng-38)
(CONF-801076-3) Avail: NTIS HC A02/MF A01

Studies performed on industrial energy conservation and pollution control are summarized. The primary purpose of the summary paper is to present the problem for the consideration of others, particularly those from industrial firms who must make the choices in selection of technologies. The paper is also presented as an appeal for more and better analyses of the energy costs of industrial pollution control equipment and new technologies related to energy efficiency improvement or fuel substitution. Industrial emissions and control costs, energy required for industrial pollution control, and effects of energy cost increase are discussed. DOE

N81-30694# Rockwell International Corp., Richland, Wash.
ENVIRONMENTAL-PROTECTION EVALUATION FOR VADOSE ZONE WELL-INJECTION STUDY: DEEP-RELEASE APPLICATIONS
R. C. Stupka Aug. 1980 28 p refs
(Contract DE-AC06-77RL-01030)
(RHO-LD-137) Avail: NTIS HC A03/MF A01

The environmental impacts associated with the Vadose Zone well injection study - deep release applications (an experimental modeling effort), are evaluated in this environmental protection evaluation. The construction phase of the project is complete. The proposed project is part of the Hanford long term transuranic defense waste program. The experiment is designed to verify the accuracy and applicability of models used to predict the movement of radionuclide containing effluents throughout the vadose zone of typical Hanford soils. By accurately predicting waste location, movements, and residence time, the knowledge derived from this study will play a major role in planning waste management programs at Hanford, and will reduce the costs associated with waste monitoring, location, and ultimate disposal. DOE

N81-30695# Pennsylvania State Univ., University Park. Dept. of Meteorology.
ENVIRONMENTAL MEASUREMENTS OF POWER PLANT COOLING TOWER AND STACK PLUMES Final Report
D. W. Thomson, ed., R. G. dePena, ed., and J. A. Pena, ed. 1981 180 p refs
(Contracts DE-AS02-76EV-02463; AT(11-1)-2463; E(11-1)-2463)
(DOE/EV-02463/6) Avail: NTIS HC A09/MF A01

The focus of this program was to establish the reality and magnitude of any environmental changes caused by the plumes from large evaporative cooling towers through a comprehensive set of measurements taken from a research aircraft. Results are divided into three sections: structure and dynamics of cooling tower plumes; chemical transformation of SO2 to sulfates in coal-fired power plant plumes; and drift deposition studies. DOE

N81-30696# Water Research Centre, Stevenage (England).
[WATER QUALITY RESEARCH] Annual Report, 1979/80
1980 32 p refs
Avail: NTIS HC A03/MF A01

Sewer deterioration and renovation is discussed as well as the effects of lead, trace organics and water hardness. The use

of sewage sludge on agricultural land, and the control of pollution in river management, urban runoff and estuaries are discussed. Wastewater experiments performed at an experimental physico-chemical sewage plant are described. Mathematical models of sewage treatment plants and for ground water pollution by nitrates were developed. Author (ESA)

N81-30697# Royal Netherlands Meteorological Inst., De Bilt.
NETWORK FOR THE DETERMINATION OF THE CHEMICAL COMPOSITION OF THE PRECIPITATION IN THE NETHERLANDS Progress Report [MEETNET VOOR BEPALING VAN DE CHEMISCHE SAMENSTELLING VAN DE NEERSLAG IN NEDERLAND]
1979 50 p refs In DUTCH; ENGLISH summary Prepared in cooperation with Rijksinst. voor Volksgezondheid
(KNMI-156-2; RIV-86/80/LMC) Avail: NTIS HC A03/MF A01

At 12 stations, constituting a network covering the whole of Holland, monthly samples were taken during 1978 and 1979 for the determination of the chemical composition of precipitation. The sampling and the analytical chemical procedures are described and their results discussed. Besides the original monthly data pertaining to a total of 14 cations and anions, data on trace metals and organic micropollutants are included. Seasonal, semiannual and annual averages are given and presented in the form of maps showing some isolines. Although in the summer of 1979 the amount of precipitation measured is on the same order as in the preceding winter, the concentrations of most components are considerably lower for that summer. However, a markedly higher N03 concentration was recorded in 1979, especially in the southern part of the country. The H concentration is also much higher for the same period. Author (ESA)

N81-30698# Missouri Univ. -Columbia. Dept. of Civil Engineering.
THE REMOVAL OF TRACE ORGANICS FROM DRINKING WATER USING ACTIVATED CARBON AND POLYMERIC ADSORBENTS Final Report, Jun. 1976 - May 1980
John T. OConnor, Diane Badorek, and Leon Thiem May 1981 111 p
(Grant EPA-R-804433)
(PB81-196768; EPA-600/2-81-077) Avail: NTIS HC A06/MF A01 CSCL 13B

A pilot plant was operated at the Kansas City Missouri Water Treatment Plant to study adsorption as a means of removing trihalomethanes and total organic carbon from drinking water. The pilot plant consisted of 15 columns 6 inches in diameter and each containing about a 3 ft depth of a granular adsorbent. Granular activated carbons and polymeric adsorbents were compared in four extended tests conducted over periods of 183, 111, 65, and 129 days. The pilot plant studies demonstrated the effects of regeneration, variations in trace organic concentration, and depth of adsorbent on trace organic removal including effluent concentration and adsorption capacity. GRA

N81-30699# National Commission on Air Quality, Washington, D.C.
TO BREATHE CLEAN AIR: REPORT OF THE NATIONAL COMMISSION ON AIR QUALITY
William H. Lewis, Jr., Katherine Y. Cudlipp, Richard A. Penna, Morris A. Ward, and Paul Freeman Mar. 1981 375 p refs
(PB81-194920) Avail: NTIS HC A16/MF A01 CSCL 13B

Congress established the National Commission on Air Quality under the Clean Air Act Amendments of 1977 to make an independent analysis of air pollution control and alternative strategies for achieving the goals of the Act. The 13-Member Commission was charged with compiling and assessing information on environmental, technological, scientific, and social issues relating to air quality policy. This report provides a basis for the continuing examination of programs for achieving the protection of public health and welfare and the preservation of clean air. GRA

N81-30700# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
PROCEEDINGS OF THE 4TH WORKSHOP ON CATALYTIC COMBUSTION Report, Sept. 1978 - May 1980
John P. Kesselring, comp. Aug. 1980 561 p refs Workshop held at Cincinnati, 14-15 May 1980
(Contract EPA-68-02-3122)
(PB81-176067; EPA-600/9-80-035; IERL-RTP-1077) Avail: NTIS HC A24/MF A01 CSCL 13B

The results of recent research in the areas of catalyst performance, components and applications of catalytic combustion systems, and the use of alternative fuels in catalytic combustors were presented. The current state of the art in the application of catalyst systems for pollution control and performance improvement are discussed. Applications include fire tube and water tube boilers, and gas turbines for utility, industrial, automotive, and aircraft systems. GRA

N81-30701# Technology Service Corp., Santa Monica, Calif.
HISTORICAL EMISSION AND OZONE TRENDS IN THE HOUSTON AREA Final Report
Marilyn Davis and John Trijonis Apr. 1981 134 p refs
(Contract EPA-68-02-2976)
(PB81-184574; EPA-600/3-81-027) Avail: NTIS HC A07/MF A01 CSCL 13B

An analysis of historical trend data for emissions and air quality in Houston for the period 1974-78 was conducted for the purposes of checking an O3-predicting model and of exploring empirical relations between emission changes and O3 air quality in the Houston area. Results from the testing analysis were inconclusive, because the O3 air quality changes during the 1974-78 period were very small. Results from the emissions-to-air quality empirical relationship analysis explained the previously noted paradox that the O3 air quality did not improve despite substantial control of hydrocarbon emissions during 1974-78. The explanation is that source growth during that period nearly offset the effect of emission controls and that many such controls were installed prior to 1974. GRA

N81-30702# Radian Corp., Austin, Tex.
SELECTIVE CATALYTIC REDUCTION AND NOx CONTROL IN JAPAN Final Report, Mar. 1980 - Jan. 1981
Gary D. Jones Mar. 1981 269 p
(Contract EPA-68-02-3171)
(PB81-191116; RAD-81-203-001-27-07; EPA-600/7-81-030) Avail: NTIS HC A12/MF A01 CSCL 13B

Overall goals of the study were to obtain new information on curent issues concerning application of FGT technology and to update information previously published. A total of 28 equipment vendors, process operators, government agencies, and industry groups were contacted. Substantial recent progress was discovered with regard to commercial applications of selective catalytic reduction (SCR) technology to gas and oil fired boilers. There are several applications where SCR systems are operated continuously and are successfully removing 80% of the NOx from the flue gas stream. GRA

N81-30703# United States Steel Corp., Monroeville, Pa.
DESIGN OF A LABORATORY FOR PARTICULATE ANALYSIS
R. J. Lee, J. S. Lally, and R. M. Fisher May 1981 80 p refs
(Contract EPA-68-02-3247)
(PB81-191132; EPA-600/4-81-032) Avail: NTIS HC A05/MF A01 CSCL 13B

The design of a suitable facility and the development of recommendations for equipment and personnel are discussed. The need for such a facility is reviewed; the considerable investment in equipment and large annual operating expenses are justified, and a conceptual framework for a particulates analysis laboratory is formulated. The basis for selection of optimum equipment, the results of a detailed survey of equipment manufacturers, the design layout of the proposed laboratory, the availability of skilled personnel, and a review of analysis methodology are summarized. GRA

N81-30704# Statewide Air Pollution Research Center, Riverside, Calif.
ATMOSPHERIC MEASUREMENTS OF TRACE POLLUTANTS: LONG PATH FOURIER TRANSFORM INFRARED SPECTROSCOPY Final Report, Jun. 1976 - May 180
Ernesto C. Tuazon, Arthur M. Winer, Richard A. Graham, and James N. Pitts Apr. 1981 104 p refs
(Grant EAA-R-804546)

(PB81-179848; EPA-600/3-81-026) Avail: NTIS HC A06/MF A01 CSCL 14B

Described are the results of a four-year study to measure trace pollutant concentrations in polluted atmospheres by kilometer pathlength Fourier transform infrared (FT-IR) absorption spectroscopy. Collaborative studies to validate analytical and sampling techniques for measuring HNO3, NH3, and HCHO are described. In these studies the km pathlength FT-IR spectrocopic technique served as the reference method. The ambient air data collected for trace pollutant concentrations over the four-year period, together with the results of several collaborative studies to validate methods, provide a critically needed data base for stringently testing the chemical kinetic submodels of the current generation of widely used urban airshed models. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N81-30705 Colorado Univ. at Boulder.
THE SEISMO-TECTONIC HISTORY AND NORPHOLOGICAL EVOLUTION OF LATER QUATERNARY FAULT SCARPS IN SOUTHWESTERN UTAH Ph.D. Thesis
Horst Michael Sterr 1980 286 p
Avail: Univ. Microfilms Order No. 8114010

Late Quaternary normal-slip faults with a (near-) vertical displacement are widespread in southwestern Utah. Since they offset terraces and erosion surfaces, they form conspicuous fault scarps whose shape changes systematically with time. A reliable measure of such change could help determine the age of individual fault scarps and so aid in assessing the seismic risks associated with the faults responsible for them. In Beaver Basin, at the eastern edge of the Basin and Range Province, a sequence of erosional and depositional surfaces was repeatedly faulted so that successively higher and older surfaces are displaced by more faulting events. The age of any surface in the sequence is the maximum age of the faults that displace it and the minimum age for those that offset only the higher surfaces. Uranium-trend dating was applied to four soil profiles on different surfaces in Beaver Basin. Dissert. Abstr.

N81-30706 California Inst. of Tech., Pasadena.
GEOLOGY OF THE CRYSTALLINE BASEMENT COMPLEX, EASTERN TRANSVERSE RANGES, SOUTHERN CALIFORNIA: CONSTRAINTS ON REGIONAL TECTONIC INTERPRETATION Ph.D. Thesis
Robert Edward Powell 1981 504 p
Avail: Univ. Microfilms Order No. 8115610

About 3000 sq km within the crystalline basement complex were mapped at scales of 1:36,000 and 1:62,500 and compiled at 1:125,000. Rocks of the crystalline complex that are older than the Mesozoic batholiths comprise two lithologically distinct terranes, called the Joshua Tree and San Gabriel terranes, superposed along a previously unrecognized low-angle fault system of regional extent, the Red Cloud thrust. The structurally lower Joshua Tree terrane is defined to include Precambrian granite capped by a paleo-weathered zone and overlain nonconformably by orthoquartzite that interfingers westward with pelitic and feldspathic granofelses. This stratigraphically coherent package was pervasively deformed in proximity to the early Red Cloud thrust. Northeast-trending metamorphic isograds are superimposed on the Joshua Tree terrane. Dissert. Abstr.

N81-30707 Illinois Univ. at Urbana-Champaign.
STRATIGRAPHY OF TILL AND LAKE BEDS OF LATE WISCONSINAN AGE IN IROQUOIS AND NEIGHBORING COUNTIES, ILLINOIS Ph.D. Thesis
David Warren Moore 1981 211 p
Avail: Univ. Microfilms Order No. 8114450

Three surficial rock-stratigraphic till units and six textural units within glacial lake beds were recognized in Wisconsinan till plains 130 km south of Chicago. These deposits record fluctuations in the northward-retreating Woodfordian glacier between 17,000 and 14,500 yrs. BP., intially Lake Michigan Lobe, followed by Erie-Huron Lobe. Early in the period the Lake Michigan Lobe covered the entire area depositing the Snider Till Member of the Wedron Formation (till 2) in three successively younger and overlapping sheets and building the corresponding Chatsworth, Gilman and Marseilles Moraines. Dissert. Abstr.

N81-30708 Wisconsin Univ. - Madison.
SULFIDE-SILICATE RELATIONS OF THE STAUROLITE GRADE PELITIC SCHISTS, RANGELEY QUADRANGLE, MAINE Ph.D. Thesis
Darrell James Henry 1981 798 p
Avail: Univ. Microfilms Order No. 8112542

A detailed investigation of the interrelations of sulfides with the silicate and oxide minerals in the staurolite grade metapelites in an area in which the geologic setting is well established is provided. The metapelites, containing variable amounts of pyrrhotite, were collected within a small area in the staurolite zone in order to permit study of the sulfide-silicate relations under nearly isothermal, isobaric conditions. The metapelites have undergone three major metamorphic events and two deformational events related to the Devonian Acadian orogen. Petrographic and chemical evidence indicates that equilibrium was closely approached during the final metamorphic event. A detailed characterization of the metamorphic phase assemblages and mineral chemistry of the metapelites was made. The silicate mineral assemblages are, in general, consistent with those AFM and AKNa assemblages expected for staurolite zone metapelites. Dissert. Abstr.

N81-30709 Rice Univ., Houston, Tex.
ANTARCTIC GLACIAL CHRONOLOGY REFLECTED IN THE OLIGOCENE THROUGH PLIOCENE SEDIMENTARY SECTION IN THE ROSS SEA Ph.D. Thesis
Katherine M. Balshaw-Biddle 1981 150 p
Avail: Univ. Microfilms Order No. 8116939

Over 24% of the ice surface area covering East and West Antarctica drains into the Ross Sea and supplies the Ross Ice Shelf. The dominant proportion of this ice originates from the West Antarctic subcontinent. Thus, any change in the glacial regime in West Antarctica, and to a lesser extent East Antarctica, may well be preserved in the thick sequence of sediments underlying the Ross Sea. The Oligocene through Pliocene portion of this glacial marine section was studied using depositional models derived from the abundant piston core data in the region. The sedimentologic evidence from the Ross Sea glaxial section is combined with evidence from the literature to establish a glacial chronology for the East and West Antarctic subcontinents. Dissert. Abstr.

N81-30710 Utah Univ., Salt Lake City.
GEOCHEMISTRY OF HYDROTHERMAL SERICITE AND CHLORITE Ph.D. Thesis
Judith Mary Ballantyne 1981 146 p
Avail: Univ. Microfilms Order No. 8116780

Hydrothermal sericite and chlorite occur with a wide variety of associated minerals in many o the common alteration assemblages formed by the interaction of hot water and rock. Chemical composition of sericite from one active geothermal field (Roosevelt Hot Springs, Utah) and two porphyry copper systems (Southwest Tintic, Utah, and Santa Rita, New Mexico) were obtained by electron microprobe to determine the amount and type of cation substitution that exists. Chlorites from Roosevelt Hot Springs and Southwest Tintic were also analyzed. Thermodynamic methods were used to estimate chemical characteristics of fluids associated with sericite and chlorite formation. Dissert. Abstr.

N81-30711 California Univ., San Diego.
ION BOUNCE-PHASE CLUSTERS IN THE EARTH'S NIGHTSIDE MAGNETOSPHERE Ph.D. Thesis
John Michael Quinn, III 1981 129 p
Avail: Univ. Microfilms Order No. 8116836

The UCSD particle detectors onboard three geosynchronous spacecraft observed the dispersing remains of localized ion clusters over several bounce periods in the geomagnetic mirror field. The measured velocity dispersion of the ions allows determination of the ion species and the bounce-phase location of the original

cluster. Four low pitch angle, nightside events were selected for analysis. The clusters in two events are composed primarily of protons originating near the magnetic equator. A third cluster is composed of oxygen, arising at low altitude near the mirror point. The fourth event contains proton clusters with near simultaneous origins in both the equatorial and low altitude regions. The equatorial excitation process is modeled using a transient westward electric field. This electric field energizes the gradient and curvature drifting ions preferentially in the equatorial region, yielding an enhanced cluster and violating conservation of the second adiabatic invariant. Dissert. Abstr.

N81-30712 Drexel Univ., Philadelphia, Pa.
LRIR OBSERVATIONS OF THE STRUCTURE AND PROPAGATION OF THE STATIONARY PLANETARY WAVES IN THE NORTHERN HEMISPHERE DURING DECEMBER 1975 Ph.D. Thesis
William James Kohri 1981 331 p
Avail: Univ. Microfilms Order No. 8115462

A statistical Kalman filter algorithm was implemented and tested for use in the construction of synoptic distributions of stratospheric field variables from asynoptic satellite data. The method provides for an interpolation in time as well as some degree of spatial smoothing. Test results showed that the filter algorithm was capable of providing reliable daily estimates of planetary wave amplitude and phase for situations characterized by less than 100% satellite data recovery. The filtering algorithm was used in the analysis of stratospheric temperature data obtained from the Limb Radiance Inversion Radiometer (LRIR) experiment. Dissert. Abstr.

N81-30713 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SOME RECENT ADVANCES IN THERMOSPHERIC MODELS
G. Kockarts 1980 28 p refs Presented at 23rd COSPAR Plenary Meeting, Budapest, 2-14 Jun. 1980 Submitted for publication
(Aeronomica-Acta-A-222-1280) Avail: Issuing Activity

The reliability of semiempirical atmospheric models is discussed within the framework of known physical phenomena. Over a period of three years, five semiempirical models of the upper atmosphere were published, following the appearance of the last COSPAR international reference atmosphere, but these models do not entirely agree with each other for all geophysical conditions. Specific discrepancies are pointed out and a comparison is made for atomic nitrogen (permanently minor constituent), showing results which differ by a factor of two. The introduction of longitudinal effects in some models is justified, but this improvement is not enough to compensate for the differences between total densities deduced from the various models.
Author (ESA)

N81-30714 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE EARTH'S MAGNETOSPHERE: A NATURAL LABORATORY FOR PLASMA STUDIES [LA MAGNETOSPHERE TERRESTRE, LABORATOIRE NATUREL POUR L'ETUDE DES PLASMAS]
M. Roth 1981 44 p refs In FRENCH; ENGLISH summary Presented at Cercle Astron. de Tournai, France, 21 Nov. 1980 Submitted for publication
(Aeronomica-Acta-A-230-1981) Avail: Issuing Activity

The structure of the magnetosphere is explained. Past and present research work related to the magnetosphere is reviewed. The physical mechanism of an aurora, its spatial distribution, solar wind effects, magnetic substorms, the influence of the interplanetary magnetic field and other topics are discussed. The role played by the ISEE satellites in current magnetosphere research is examined. The contribution of magnetospheric research to plasma physics is illustrated. Author (ESA)

N81-30715*# Hampton Inst., Va. Dept. of Physics and Engineering Studies.
LOCAL EFFECTS OF PARTLY CLOUDY SKIES ON SOLAR AND EMITTED RADIATIONS Progress Report, 1 Aug. 1980 - 31 Jul. 1981
D. A. Whitney and D. D. Venable 31 Jul. 1981 67 p refs (Grant NAG1-87)
(NASA-CR-164694) Avail: NTIS HC A04/MF A01 CSCL 04A

Solar radiation measurements are made on a routine basis. Global solar, atmospheric emitted, downwelled diffuse solar, and direct solar radiation measurement systems are fully operational with the first two in continuous operation. Fractional cloud cover measurements are made from GOES imagery or from ground based whole sky photographs. Normalized global solar irradiance values for partly cloudy skies were correlated to fractional cloud cover. T.M

N81-30716# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STANDING WAVES IN THE SOUTHERN HEMISPHERE FORCED BY TOPOGRAPHY, HEAT SOURCES, AND HEAT SINKS Ph.D. Thesis [ONDAS ESTACIONARIAS FORCADAS PELA TOPOGRAFIA E PELAS FONTES E SUMIDOUROS DE CALOR NO HEMISFERIO SUL]
Rubens Leite Vianello May 1981 130 p refs In PORTUGUESE; ENGLISH summary
(INPE-2080-TDL/055) Avail: NTIS HC A07/MF A01

Standing waves were studied using a two level quasi-geostrophic, beta plane model, which includes variation in the meridional and vertical directions. Initially, the model is applied to the Northern Hemisphere in order to verify its efficiency in reproducing the known theoretical and observational results. It is found that the model, although different in mathematical formulation, has enough fidelity for the study of stationary disturbances. The model was then used to study the response of topography and diabatic heating, separately and jointly in the Southern Hemisphere. T.M

N81-30717# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBSERVATIONS OF BANDS (9,4), (8,3), (7,2), (6,2), AND (5,1), ATMOSPHERIC LUMINESCENCE, AND THE MECHANISM OF PRODUCT OF EXCITED OH IN THE UPPER ATMOSPHERE [OBSERVACOES DAS BANDAS (9,4), (8,3), (7,2), (6,2) E (5,1) DA EMISSAO OH NA LUMINESCENCIA ATMOSFERICA E O MECANISMO DE PRODUCAO DA OH ESCITADA NA ALTA ATMOSFERA]
Hisao Takahashi Apr. 1981 149 p refs In PORTUGUESE; ENGLISH summary
(INPE-2046-TDL/050) Avail: NTIS HC A07/MF A01

A multi-channel tilting filter photometer was constructed to measure the band intensity and the rotational temperature of the five OH bands. It was observed that the nocturnal variations of the five bands show good correlation between them, but there are small differences in the amplitude of the variation between the bands from the upper vibrational levels and those from the lower levels. The observed vibrational temperature show an increase before midnight and a decrease after midnight. Cross correlation studies between the band intensities show that the nocturnal variation of the upper vibrational bands lead those of the lower levels; for example, there is a difference of about 15 minutes between the (9,4) band and the (5,1) band. Vibrational population rates and initial excitation rates for each vibrational level are calculated. T.M

N81-30718# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMPLICIT SCHEMES FOR NUMERIC INTEGRATION. PART 1: LONG BARATROPIC AND GRAVITY WAVE EQUATIONS [ESQUEMAS IMPLICITOS DE INTEGRACAO NUMERICA PARTE 1: EQUACOES DE ONDAS LONGAS, BARATROPICAS DE GRAVIDADE]
Marco Antonio Maringolo Lemes and Yoshihiro Yamazaki Mar 1981 37 p refs In PORTUGUESE; ENGLISH summary
(INPE-2015-RPE/287) Avail: NTIS HC A03/MF A01

Implicit finite-difference schemes used in Numerical Weather Prediction because the time saved in the calculations may be used in improving the accuracy of the space finite-difference schemes. The computational properties of an implicit scheme were studied. This scheme is a modified version of the well-known Shuman-Brown-Campana scheme, in the sense that a 3 level time average operator is also applied to the divergence term in the continuity equation. Preliminary results, obtained by considering the equations that govern long barotropic gravity waves show that the scheme, besides being economical, has a corrective

effect on the spurious phase propagation of the waves, thus minimizing the intrinsic disavantage of the conventional leapfrog scheme. T.M.

N81-30719# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DISSIPATION OF TURBULENT ENERGY AND BUDGETS IN THE ATMOSPHERIC BOUNDARY LAYER M.S. Thesis - 5 May 1980 [DISSIPACAO TURBULENTA DE ENERGIA E PROCESSES DE TROCA NA CAMADA LIMITE ATMOSFERICA]

Jorge Conrado Conforte Feb. 1981 121 p refs In PORTUGUESE; ENGLISH summary
(INPE-1994-TDL/038) Copyright. Avail: NTIS HC A06/MF A01

Results show that, in the unstable surface layer, all terms of the energy budget are substantial. Turbulent kinetic energy generated through buoyancy forces is transported out of the layer, the dissipation rate can be regarded as approximately the sum of mechanical production and the residual. It is difficult to describe the properties of the static pressure fluctuations that occur within the turbulent flow of the lower atmospheric boundary layer from profile measurements. During stable stratification, energy losses due to work done against gravity and the divergence of vertical flux of the turbulent kinetic energy are smaller than the dissipation. T.M.

N81-30720# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARISON OF EQUATORIAL ELECTROJET CHARACTERISTICS AT HUANCAYO AND EUSEBIO (FORTALEZA) IN THE SOUTH AMERICAN REGION

Rajaram Purushottam Kane and Nalin Babulal Trivedi Jul. 1981 27 p refs Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 1981 Submitted for publication
(INPE-2175-RPE/390) Copyright. Avail: NTIS HC A03/MF A01

The H, D, Z average daily variations for 5 international quiet days are compared for Huancayo (12 S, 75 W, dip + 1.9) and Eusebio near Fortaleza (4 S, 39 W, dip - 3.5) in the South American region, for the 12 successive months, Oct. 1978 - Sep. 1979. The H range shows that the electrojet is weaker in the Fortaleza region. Also, the electrojet center has latitudinal excursions from month to month at both the locations, but not in a similar way. The D variations indicate roughly a Northern Hemisphere Sq current system influence at Eusebio, (Fortaleza), while at Huancayo the influence is southern in some months and mixed or northern in other months. However, there seem to be significant north-south components at midday in some months. It seems that the overhead Sq current pattern changes in form, while moving over from the Fortaleza region to the Huancayo region. Author

N81-30721# Ohio State Univ., Columbus. ElectroScience Lab.

A SYNERGISTIC INVESTIGATION OF THE INFRARED WATER VAPOR CONTINUUM Final Report, 1 Apr. 1977 - 30 Sep. 1980

R. J. Nordstorm, M. E. Thomas, E. K. Damon, and R. K. Long Apr. 1981 119 p refs
(Contract DAAG29-77-C-0010)
(AD-A101669; ESL-784701-7; ARO-14702.5-GS) Avail: NTIS HC A06/MF A01 CSCL 04/1

Attenuation of infrared absorption in the troposphere is dominated by water vapor absorption. Most past work on the spectroscopy of water vapor has been on the analysis of the rotational and vibrational bands. Efforts to model the continuum absorption have not been as successful. It is demonstrated here that the far-wing phenomena is important in modeling the small but significant absorption in the continuum regions.
Author (GRA)

N81-30722*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

AURORAL KILOMETRIC RADIATION: A THEORETICAL REVIEW Progress Report

Crockett L. Grabbe 15 May 1981 45 p refs Submitted for publication
(Grant NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-164728; AD-A101687; U-OF-IOWA-81-20) Avail: NTIS HC A03/MF A01 CSCL 04/1

A number of theories have been proposed in recent years to explain auroral kilometric radiation. These include an anisotropic velocity distribution instability, mode conversion of electron cyclotron waves to ordinary mode radiation, soliton radiation, beam driven instability of electromagnetic waves via low frequency turbulence, a loss cone instability, beating of coherent electrostatic waves, and beam amplification of electromagnetic waves via coherent density fluctuations. These will all be reviewed and comparisons of prediction made with observations. Emphasis will be placed on the three recent proposals. Author (GRA)

N81-30723# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.

FOURIER MODULUS IMAGE CONSTRUCTION Final Technical Report, 7 Sep. 1979 - 30 Sep. 1980

James E. Fienup May 1981 70 p refs
(Contract F30602-80-C-0002)
(AD-A101728; RADC-TR-81-63) Avail: NTIS HC A04/MF A01 CSCL 04/1

This report describes the investigation of a new method for recovering diffraction-limited images through the turbulent atmosphere. It consists of an iterative algorithm that constructs an image from Fourier modulus data which is measured by stellar speckle interferometry. Research results indicate that the method has the potential for providing diffraction-limited images of Earth-orbiting satellites. Image construction experiments were performed on Fourier modulus data computer-simulated to include the effects of atmospheric turbulence, diffraction, photon (Poisson statistics) noise, and a finite number of short-exposure images. The quality of the constructed images was found to degrade in a gradual and predictable manner as the signal-to-noise ratio decreases. The rms error of the constructed images was found to vary approximately as the square root of the rms error of the Fourier modulus data. Diffraction-limited images were constructed for levels of photon noise that would be expected for imaging satellites through a 1.6-meter telescope. Image construction experiments were performed on the Fourier modulus of a number of different objects of varying complexity. Interpretation of the results was complicated by a tendency of the algorithm to stagnate at local minimum having the appearance of a good quality image superimposed by a pattern of stripes. Nevertheless, results were suggestive that the solution is usually unique. GRA

N81-30724# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

DOPPLER SPECTRAL CHARACTERISTICS OF HIGH LATITUDE IONOSPHERIC IRREGULARITIES: EFFECT ON HF RADARS Final Technical Report, 23 Apr. - 30 Sep. 1980

Raymond A. Greenwald Griffiss AFB, N.Y. RADC May 1981 143 p refs
(Contract N00024-78-C-5384; AF Proj. 2305)
(AD-A101729; RADC-TR-81-93) Avail: NTIS HC A07/MF A01 CSCL 17/9

This report considers the Doppler spectral properties of radar signals scattered from high latitude E and F-region ionospheric irregularities. Although the exact mechanism for the production of F-region irregularities is not yet known, it appears that the Doppler shift from these as well as from E-region irregularities is determined by the ionospheric electric field via the E X B/B-squared drift velocity. The width of the backscattered spectra is determined by the viewing angle of the radar relative to the E X B/B-squared drift direction as well as the drift magnitude. Assuming an electrical potential distribution over the Earth's high latitude regions, it has been possible to predict the diurnal variability of the Doppler velocity and width associated with high latitude irregularities. Although some of these predictions agree with previous observations, considerably more knowledge is required of the high latitude potential distribution and its temporal variability. Finally, a novel new technique is proposed whereby through cross spectral analysis the detrimental effects of clutter due to ionospheric irregularities may be eliminated.
Author (GRA)

N81-30725# Holmes and Narver, Inc., Las Vegas, Nev. Energy Support Div.
GEOTHERMAL INDUCED SEISMICITY PROGRAM PLAN
Mar. 1981 21 p
(Contract DE-AC08-76NV-00020)
(HN-00020-1094) Avail: NTIS HC A02/MF A01

The program calls for baseline seismic monitoring in regions of known future geothermal development, continued seismic monitoring and characterization of earthquakes in zones of geothermal fluid production and injection, modeling of the earthquake-inducing mechanism, and in situ measurement of stresses in the geothermal development. The Geothermal Induced Seismicity Program (GISP) will have as its objectives the evaluation of the seismic hazard, if any, associated with geothermal resource exploitation and the devising of a technology which, when properly utilized, will control or mitigate such hazards. DOE

N81-30726# Geological Survey, Denver, Colo.
GEOLOGIC DATA FOR BOREHOLE ERDA-6, EDDY COUNTY, NEW MEXICO
C. L. Jones 1981 63 p refs
(Contract DE-AC08-76NV-00038)
(USGS-OFR-81-468) Avail: NTIS HC A04/MF A01

The hole was drilled to evaluate a candidate site for a nuclear waste repository which was subsequently rejected on the basis of geologic data. The rocks penetrated include surficial deposits of Quaternary age; the Santa Rosa Sandstone of Triassic age; and the Dewey Lake Red Beds, the Rustler Formation, the Salado Formation, and part of the Castile Formation, all of Permian age. The pre-Quaternary rocks are sharply deformed into an anticline that has a faulted core of salt and anhydrite containing a reservoir of geopressured brine carrying H2S, CO2, in solution. The structure of the rocks and the geopressured brine are severe geologic impediments to the design, construction, and operation of a nuclear waste repository at the candidate site. DOE

N81-30727# Sandia Labs., Albuquerque, N. Mex.
APPLICATIONS OF REFLECTION SEISMICS TO MAPPING COAL-SEAM STRUCTURE AND DISCONTINUITIES
T. L. Dobecki and L. C. Bartel 1981 7 p refs Presented at the Conf. on the Ground Control in Mining, Morgantown, W. Va., 27 Jul. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1069C; CONF-810714-1) Avail: NTIS HC A02/MF A01

Three US field projects were reviewed. Each project employed its own particular seismic technique, recording system, and seismic energy source although all are considered state-of-the-art, high resolution, digital seismic surveys. Project 1 (thin, Pennsylvania coal) sought detection of sand channels using dynamite and standard in-line (2-D) seismic technique. Project 2 (thick, Wyoming underground coal gasification) involved a gas-explosion (Dinoseis) source with areal (3-D) acquisition methods. Project 3 (thick Washington underground coal gasification) employed a shotgun-type source and standard in-line methods. Each project was successful in accomplishing its own particular objective; however, data quality and interpretation seem to be more a function of thickness of the target seam, complexity of the overburden, and processing contractor than a seismic source, acquisition scheme (2-D versus 3-D), or recording instrumentation. DOE

N81-30728# Argonne National Lab., Ill. Energy and Environmental Systems Div.
TROPOSPHERIC EFFECTS OF SATELLITE POWER SYSTEMS
K. L. Brubaker and J. Lee 1980 10 p refs Presented at the AIAA Intern. Meeting and Tech. Display Global Technol. 2000, Baltimore, 6-8 May 1980
(Contract W-31-109-eng-38)
(CONF-800590-4) Avail: NTIS HC A02/MF A01

The construction and operation of a system of solar power satellites is expected to have a variety of effects on the troposphere. The launching of large space vehicles affects the air quality in the vicinity of the launch site, and the ground cloud associated with such a launch is known to stimulate the growth of water clouds under some circumstances. The transmission of power from satellite to the Earth's surface may affect certain meteorological parameters in the vicinity of the rectenna site. These and other effects are discussed in reference to the proposed solar power satellite system. DOE

N81-30729# Los Alamos Scientific Lab., N. Mex.
LOCATION, AGE, AND ROCK TYPE OF VOLCANIC ROCKS YOUNGER THAN 5 MILLION YEARS IN ARIZONA AND NEW MEXICO
M. J. Aldrich, Jr. and A. W. Laughlin Apr. 1981 24 p refs
(Contract W-7405-eng-36)
(LA-8820-MS) Avail: NTIS HC A02/MF A01

As part of the assessment of the Hot Dry Rock geothermal energy potential of Arizona and New Mexico, a compilation of the locations and ages of volcanic rocks less than 5 million years was made. The locations of those rocks less than 3 million years are shown on a map of the region. The compilation is presented as a tabulation. The table is organized first by state and secondly by latitude and longitude within each state. Rock type, age and error, method of dating, and original reference are given. DOE

N81-30730# Science Applications, Inc., Palo Alto, Calif.
TECHNIQUE TO RELIABLY ESTIMATE EARTHQUAKE-RECURRENCE INTERVALS Interim Report
E. D. Bloom May 1981 80 p refs
(EPRI Proj. 1233-1)
(EPRI-NP-1857) Avail: NTIS HC A05/MF A01

Available world earthquake occurrence data were analyzed and the existence of an upper bound on earthquake magnitude was demonstrated. It is shown that the shape of the frequency magnitude curve is statistically the same everywhere in the world for both seismically active an inactive regions. This universal shape is valid for regions as small as tectonic zones, and good results were obtained for single site excavations. It is concluded that the results are applicable to obtain best estimate values for earthquake risk. DOE

N81-30731# Texas Univ., Austin. Bureau of Economic Geology.
STRUCTURE OF THE PRESIDIO BOLSON AREA, TEXAS, INTERPRETED FROM GRAVITY DATA
J. R. Mraz and G. R. Keller 1980 23 p refs Prepared in cooperation with Texas Univ. at El Paso
(Contracts DE-AS05-76ET-28388; EY-76-S-05-5106)
(DOE/ET-28388/T1) Avail: NTIS HC A02/MF A01

The structure and tectonism of a region was studied. The integrated geophysical geology of the Presidio area, Texas, using gravity measurements and deep drilling data was examined. New gravity data were combined with existing data to construct simple Bouguer anomaly maps of the Presidio area, and two dimensional computer modeling of gravity profiles was used to derive earth models. These data outline the major geologic features of the area that are dominated by the effects of Tertiary block faulting and volcanism. The main feature was the Presidio Graben, which is approximately 1.5 km deep near Ruidosa, Texas. It was found that hot springs associated with the Presidio Graben derive their heat from deep circulation along its boundary faults. However, some gravity anomalies indicate the presence of late Tertiary intrusions which provide heat for the hot springs. DOE

N81-30732# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
OCCULTATION OF THE ATS-3 SATELLITE BY THE AVEFRIA BARIUM ION CLOUD
T. J. Fitzgerald, D. J. Simons, M. B. Pongratz, and J. R. Clynch 1981 8 p refs Presented at the Ionospheric Effects Symp., Alexandria, Va., 14 Apr. 1981 Prepared in cooperation with Los Alamos National Lab., N. Mex. and Texas Univ., Austin
(Contract DE-AC08-76NV-01183)
(CONF-810421-3) Avail: NTIS HC A02/MF A01

The experiment on AVEFRIA DOS barium release occulted the line of sight from one of the ground observation stations to the ATS-3 satellite by the barium ion cloud for approximately 5 minutes. Optical measurements of the structured barium ion cloud were made with intensified cameras. The optical measurements are used to correlate the barium column density with the total electron content measurements and to calculate the scintillation index, S4, and the two dimensional intensity pattern for comparison with the measured amplitude scintillations. DOE

N81-30733# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
NEW APPROACHES TO PROBLEMS OF FLUID FLOW IN FRACTURED-ROCK MASSES
Paul A. Witherspoon, Yvonne W. Tsang, Jane C. S. Long, and Jahandar Noorishad Mar. 1981 21 p refs Presented at the 22nd U.S. Symp. on Rock Mech., Cambridge, Mass., 29 Jun. - 2 Jul. 1981
(Contract W-7405-eng-48)
(LBL-12511; CONF-810624-7) Avail: NTIS HC A02/MF A01

An expression was developed for fluid flow in a deformable fracture. The problem of how to treat flow through networks of fractures is addressed. It is customary to consider a discontinuous rock mass by some equivalent porous medium but it raises some important questions that are discussed. A fully coupled finite element code for flow through fractured porous media subject to thermal, hydraulic and mechanical stresses is discussed. DOE

N81-30734# Los Alamos Scientific Lab., N. Mex. Dept. of Geology.
GEOLOGIC AND GEOPHYSICAL INVESTIGATIONS OF THE ZUNI-BANDERA VOLCANIC FIELD, NEW MEXICO
Mark E. Ander, Grant Heiken, John Eichelberger, A. W. Laughlin, and Stephen Huestis May 1981 41 p refs
(Contract W-7405-eng-36)
(LA-8827-MS) Avail: NTIS HC A03/MF A01

A positive, northeast-trending gravity anomaly, 90 km long and 30 km wide, extends southwest from the Zuni uplift, New Mexico. The Zuni-Bandera volcanic field, an alignment of 74 basaltic vents, is parallel to the eastern edge of the anomaly. Lavas display a bimodal distribution of tholeiitic and alkalic compositions, and were erupted over a period from 4 Myr to present. A residual gravity profile taken perpendicular to the major axis of the anomaly was analyzed using linear programming and ideal body theory to obtain bounds on the density contrast, depth, and minimum thickness of the gravity body. DOE

N81-30735# Danish Meteorological Inst., Copenhagen.
ELECTRIC FIELDS IN THE DAYSIDE AURORAL REGION
T. Stockflet Jorgensen 1980 20 p refs Presented at NATO Advan. Study Inst. on Exploration of the Polar Upper Atmosphere, Lillehammer, Norway, 5-16 May 1980
(DMI-Geophys-Papers-R-62; ISBN-87-7478-180-4) Avail: NTIS HC A02/MF A01

Data concerning electric fields perpendicular to the Earth's magnetic field in the dayside auroral region at relatively low altitudes (below about 1,000 km) are reviewed. Experimental investigations by means of satellites, rockets, balloons, and incoherent scatter radars, are summarized and the results of these investigations compared. The relation between interplanetary magnetic field and dayside high latitude electric fields and equivalent plasma convection is considered. A model of the dayside high-latitude convection pattern is proposed. Results of dayside rocket electric field experiments for which the ionospheric electric field and the horizontal magnetic disturbance vector on the ground could be compared are presented, showing that inference of direction of convection from ground magnetic observations is not advisable in this region. Simultaneous observations of electric fields and aurora at dayside high latitude imply that auroral arcs are not flow aligned and horizontal currents occur along auroral arcs. Author (ESA)

N81-30736# National Weather Service, Salt Lake City, Utah.
RADAR BORESIGHTING VERIFICATION PROGRAM
Thomas E. Adler Nov. 1980 17 p
(PB81-182677; NOAA-80122302; NOAA-NWS-WRCP-22) Avail: NTIS HC A02/MF A01 CSCL 04A

True solar altitude and azimuth are calculated for a given Julian day and time (GMT). Calculated angles are compared with those observed using solar boresighting methods described in Federal Meteorological Handbook No. 7. A document is produced which lists both observed and calculated solar angular data and differences between the two, the GMT of each observation, and the average error between observed and calculated data. If corrective action is needed to bring the radar set within allowable tolerances, a message is so indicated on the computer produced document. GRA

N81-31089*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE 20.7- AND 31.4-GHz ATMOSPHERIC NOISE TEMPERATURE MEASUREMENTS
S. D. Slobin, M. M. Franco, and C. T. Steizried *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 132-139 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 04A

N81-31091*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
X-BAND ATMOSPHERIC NOISE TEMPERATURE STATISTICS AT GOLDSTONE, DSS 13, 1979 AND 1980, AND CLEAR AIR NOISE TEMPERATURE MODELS FOR GOLDSTONE
S. D. Slobin, C. T. Steizried, E. M. Andres, and M. M. Franco *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 161-167 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N81-30737 Oklahoma Univ., Norman
A DIAGNOSTIC STUDY OF CYCLOGENESIS IN THE LEE OF THE ALPS Ph.D. Thesis
John Andrew McGinley 1981 154 p
Avail: Univ. Microfilms Order No. 8116753

Rawinsonde and satellite data are assimilated in a three dimensional analysis scheme which couples mass and momentum, and allows computation of vertical motion. This scheme is used to diagnose the characteristics of cyclone development in the lee of the Alps. By allowing the dimensions of the terrain and the data to define the appropriate magnitude of ageostrophic flow and vertical scale, horizontal and vertical motion fields are obtained which reflect the proper ratio of flow around versus over the Alps. Using quasi-Lagrangian volumes moving with the upper wave and associated baroclinic zone, the evolution of frontal strength, vorticity, and energy was examined for two lee cyclone episodes. The blocking effect on the cooler air and externally forced vertical motions are shown to increase the mean frontal zone strength as the wave interacts with the Alps.
Dissert. Abstr.

N81-30738 Wisconsin Univ. - Madison.
NUMERICAL MODELING OF CLIMATIC CHANGE FROM THE TERMINUS RECORD OF LEWIS GLACIER, MOUNT KENYA Ph.D. Thesis
Phillip Donald Kruss 1981 140 p
Avail: Univ. Microfilms Order No. 8112547

Over the last 100 years, the glaciers and lakes of East Africa have undergone dramatic change in response to climatic forcing. However, the available conventional meteorological series have not proven sufficient to explain these environmental events. The secular climatic change at Lewis Glacier, Mount Kenya is reconstructed from its terminus record documented since 1893. The short-time-step numerical model developed for this study consists of climate and ice dynamic segments. The climate segment directly computers the effect on the net balance of change in the four forcings: precipitation, albedo, cloudiness, and temperature. The flow segment calculates the dynamic glacier response to net balance variation. Dissert. Abstr.

N81-30739 International Institute for Applied Systems Analysis, Laxenburg (Austria).
POSSIBLE CLIMATIC CONSEQUENCES OF A MAN-MADE GLOBAL WARMING
H. Flohn Dec. 1980 97 p refs Sponsored in cooperation with the UN Environment Program
(IIASA-RR-80-30) Avail: Issuing Activity

Natural and man-made climatogenic processes are considered

together with methods for predicting climatic change. Natural internal climatologic processes are studied. The roles played by the polar sea and the Antarctic continental ice sheet the asymmetry of the global atmospheric circulation, equatorial upwelling, El Nino, and the hydrologic balance are included. The manmade greenhouse effect (CO2 and trace gases) is investigated. Recent climatic history is outlined together with the perception of global warming. A global warming scenario is developed from the examination of climatic changes that have occurred in the past (medieval warming, Holocene warm period, and the humid Sahara, the last interglacial period). The possible coexistence of an ice-free Arctic and a glaciated Antarctic is also considered. Author (ESA)

N81-30740*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC OBSERVATIONS FOR STS-1 LANDING

Robert E. Turner, James E. Arnold, and Gregory S. Wilson May 1981 62 p refs

(NASA-TM-82432) Avail: NTIS HC A04/MF A01 CSCL 04B

A summary of synoptic weather conditions existing over the western United States is given for the time of shuttle descent into Edwards Air Force Base, California. The techniques and methods used to furnish synoptic atmospheric data at the surface and aloft for flight verification of the STS-1 orbiter during its descent into Edwards Air Force Base are specified. Examples of the upper level data set are given. E.A.K.

N81-30741*# Silicon Technology Corp., Oakland, N. J. Research Center.

A SYSTEM DEFINITION STUDY FOR THE ADVANCED METEOROLOGICAL TEMPERATURE SOUNDER (AMTS) Final Report

Oct. 1977 40 p

(Contract JPL-954787)

(NASA-CR-164691) Avail: NTIS HC A03/MF A01 CSCL 04B

The functional requirements of Exhibit A (11) were used as the baseline for the conceptual design of a fixed grating out of plane multidetector spectrometer for the Space Shuttle application. Because the grating instrument would be large and the 28 element detector array would be difficult to cool radiatively from a free flying spacecraft and because increasing the spectral resolution of the grating instrument would be difficult in an instrument of reasonable size, a parallel study of a Nichelson interferometer spectrometer was undertaken. This type of instrument offers compact size, fewer detectors to cool, and the possibility of increased spectral resolution. The design and performance parameters of both the grating and interferometer approaches are described. The tradeoffs involved in comparing the two systems for sounding applications are discussed. A.R.H.

N81-30742# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A STUDY OF THE VERTICAL TRANSPORT OF MOMENTUM, SENSIBLE HEAT, AND WATER VAPOR OVER VEGETATION-COVERED SURFACES IN THE TROPICS [UM ESTUDO DOS TRANSPORTES VERTICAIS DE MOMENTUM, CALOR SENSIVELE VAPOR D'AGUA SOBRE SUPERFICIE VEGETADA NOS TROPICOS]

Romisio Geraldo Bouhid Andre May 1981 126 p refs In PORTUGUESE; ENGLISH summary

(INPE-2060-TDL/052) Avail: NTIS HC A07/MF A01

The energy balance changes with aerodynamic characteristics of the surface for four successive crop stage are presented. Parameterizations are used to calculate the sensible and water vapor fluxes. The results of the momentum, sensible heat and water vapor dimensionless fluxes follow the exponential relation with the dimensionless stability parameter z/L. The ratios of eddy diffusivities showed slightly high values for neutral and stable conditions. The surface energy balance data obtained characterize the several crop stages and the effect of the aerodynamic surface roughness on fluxes. T.M.

N81-30743# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

TURBULENT TRANSPORT IN THE ATMOSPHERIC SURFACE LAYER UNDER DIABATIC CONDITIONS M.S. Thesis - 8 May 1981 [TRANSPORTES TURBULENTOS NA CAMADA SUPERFICIAL DA ATMOSFERA EM CONDICOES DIABATICAS]

Maria Tereza deLima Carvalho Nogueira Mar. 1981 129 p refs In PORTUGUESE; ENGLISH summary

(INPE-2007-TDL/045) Avail: NTIS HC A07/MF A01

An expression for the diabatic wind profile is derived by various workers using dimensional analysis and the assumption that the turbulent diffusivity coefficient for momentum can be partitioned into two parts, one associated with forced convection and the other with natural convection. The turbulent diffusivity coefficient is also assumed to be given as a linear combination of the diffusivity coefficient due to forced and that due to free convection. This assumption is in contrast with the assumption of the quadratic combination of the diffusivity coefficients which, according to Sellers, leads to the equation for the third profile derived by Ellison, Yamamoto, Panofsky et al. Then, a new modified KEYPS equation is suggested by Yamamoto and Shimanuki. This modified equation is solved approximately, resulting rational exprssions for the wind shear, which lead to results that compare favorably with the observed data. However, the nondimensional temperature profiles showed some systematic deviation from the measured profiles. Nondimensional fluxes of heat and momentum are calculated using the shear functions.

Author

N81-30744*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A STUDY OF THE DYNAMICS OF DROUGHTS IN NORTHERN BRAZIL: OBSERVATIONS, THEORY, AND NUMERICAL EXPERIMENTS WITH A GLOBAL ATMOSPHERIC CIRCULATION MODEL [UM ESTUDO SOBRE A DINAMICA DAS SECAS DO NORDES TE DO BRASIL: OBSERVACOES, TEORIA E EXPERIMENTOS NUMERICOS COM UM MODELO GLOBAL DE CIRCULACAO ATMOSFERICA]

Antonio Divino Moura (Inst. de Pesquisas Espaciais, San Jose dos Campos, Brazil) and Jagadish Shukla Oct. 1980 65 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Brazilian Meteorol. Conf., Campina Grande, Brazil., 6-10 Oct. 1980 and at the 1st Conf. on Climate Variation, 19-23 Jan. 1981, San Diego, Calif.

(NASA-TM-82373; INPE-1930-RPE/255) Avail: NTIS HC A04/MF A01 CSCL 04B

The monthly mean sea surface temperature anomalies over tropical Altantic and rainfall anomalies over two selected stations for 25 years (1948-1972) were examined. It is found that the most severe drought events are associated with the simultaneous occurrence of warm sea surface temperature anomalies over north and cold sea surface temperature anomalies over south tropical Atlantic. Simultaneous occurrences of warm sea surface temperature anomaly at 15 deg N, 45 deg W and cold sea surface temperature anomaly at 15 deg S, 5 deg W were always associated with negative anomalies of rainfall, and vice versa. A simple primitive equation model is used to calculate the frictionally controlled and thermally driven circulation due to a prescribed heating function in a resting atmosphere. T.M.

N81-30745# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A STUDY OF THERMAL CIRCULATION PRODUCED NEAR COASTS M.S. Thesis - 30 May 1980 [UM ESTUDO DAS CIRCULACOES TERMICAS PRODUZIDAS PROXIMO AS COSTAS]

Sergio Henrique Franchito Dec. 1980 81 p refs In PORTUGUESE; ENGLISH summary

(INPE-1951-TDL/034) Avail: NTIS HC A05/MF A01

A prediction, two dimensional, nonlinear, primitive equation model was employed to study the land/sea breeze of north-northeast Brazil. The model considers dry air and envolves boundary layer formulation. The surface temperature is determined by a forcing function applied to the Earth's surface. The time integration scheme utilized was the Shuman Brown Company model. The seasonal variations of the circulation was studied under conditions of zero mean flow and flow terrain and the model is applied over several months, using values of land and sea surface temperatures. By including the elevated terrain, the circulation becomes more intense during both day and night, concluded that under the influence of nonzero mean flow and

flat terrain, the land/sea breeze circulation systems become slightly weaker. E.A.K.

N81-30746# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NONDIMENSIONAL FLUXES OF HEAT AND MOMENTUM IN THE ATMOSPHERIC SURFACE BOUNDARY LAYER [FLUXOS ADIMENSIONAIS DE CALOR E MOMENTUM NA CAMADA LIMITE SUPERFICIAL DA ATMOSFERA]
Maria Teresa deLima C. Nogueira and Y. Viswanadham Oct. 1980 24 p refs In PORTUGUESE; ENGLISH summary Submitted for publication
(INPE-1934-RPE/257) Copyright. Avail: NTIS HC A02/MF A01

Micrometeorological data concerning the atmospheric surface boundary layer are analyzed, to determine the nondimensional fluxes of heat and momentum through the shear functions of Eusinger and coworkers. The nondimensional momentum fluxes do not indicate a sharp transition to free convection at stability parameter zeta equal to 0.02 - 0.03. The analysis indicates, also, that the transfer mechanisms for momentum and sensible heat are not identical in a thermally stratified atmospheric flow. Finally, the ratio of the turbulent diffusivity coefficients for heat and momentum is evaluated in different atmospheric stratification conditions. It is approximately equal to 1.35 in neutral conditions, decreases slightly in stable conditions, and shows a marked increase with instability. Author

N81-30747# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
ON WIND-INDUCED UNDERWATER AMBIENT NOISE
Huon Li Mar. 1981 30 p refs
(AD-A101682; NORDA-TN-89) Avail: NTIS HC A03/MF A01 CSCL 20/10

A study of the wind dependence of underwater ambient noise is presented. This study includes a general theory of noise generation, status of available theories, and some recent noise measurements. The general theory indicates that the stresses and the motion of sea-air boundary contribute as a major source of wind induced noise, and that the boundary conditions play very important roles. Even though several theories have been developed in recent years to investigate specific mechanisms of wind induced underwater noise, careful evaluations of the theories are suggested. The wind dependence of underwater ambient noise can be identified in the frequency range 1-500 Hz (and higher) from available data. Due to possible interferences of shipping noise, system noise, and flow turbulence near the hydrophone, additional field measurements are necessary to obtain quantitative assessments of wind induced noise in the frequency range 1-100 Hz. Recommendations are given for future research work on wind induced noise. GRA

N81-30748*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
PLANETARY BOUNDARY-LAYER WIND MODEL EVALUATION AT A MID-ATLANTIC COASTAL SITE
H. W. Tieleman Oct. 1980 201 p refs
(Grant NGL-47-004-067; Contract DE-AC06-79ET-23007)
(NASA-CR-164604; DOE/ET-23007/80/1) Avail: NTIS HC A10/MF A01 CSCL 04B

Detailed measurements of the mean flow and turbulence were made with the use of a micrometeorological facility consisting of an instrumented 76-m tall tower located within a 100-m distance from the Atlantic Ocean at Wallops Island, Virginia. Under moderately strong wind conditions, the popular neutral boundary layer flow model fails to provide an adequate description of the actual flow. In addition to detailed flow information for all wind directions, averages of the important flow parameters used for design such as vertical distribution of mean velocity, turbulence intensities and turbulence integral scales were presented for wind direction sectors with near uniform upstream terrain Power spectra of the three velocity components for the prevailing northwesterly and southerly winds are discussed. DOE

N81-30749# GEOMET, Inc., Gaithersburg, Md
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE NORTHEAST REGION
K. E. Pickering, J. M. Vilardo, and J. T. Schakenbach Jun. 1980 191 p refs Prepared for Battelle Pacific Northwest Labs.
(Contract DE-AC06-76RL-01830)
(PNL-3452) Avail: NTIS HC A09/MF A01

Techniques developed to assess the wind energy resource in the Northeast are described. Wind data locations were identified and the data obtained were screened to determine their usefulness. Summarizied data were processed and wind power values were estimated for all data locations. Upper air data were used to estimate wind power on mountaintops and ridge crests. Additional information on the wind resource was gained through a survey of wind-deformed vegetation. Maps of annual and seasonal wind power classes were constructed from the computed wind power values along with the aid of landform and shaded relief maps. DOE

N81-30750# Western Scientific Services, Inc., Fort Collins, Colo.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE NORTH CENTRAL REGION
D. L. Freeman Mar. 1981 84 p refs Prepared for Battelle Pacific Northwest Labs.
(Contract DE-AC06-76RL-01830)
(PNL-3667) Avail: NTIS HC A05/MF A01

The development of a regional wind energy resource atlas for the North Central Region, which consists of North Dakota, South Dakota, Nebraska, Minnesota, and Iowa is discussed. A description of observational and analytical techniques used in the development of the North Central region's wind energy resource atlas is given. DOE

N81-30751# Environmental Research and Technology, Inc., Concord, Mass.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE GREAT LAKE REGION
D. L. Paton, A. Bass, and D. G. Smith Feb. 1981 132 p refs Sponsored by DOE Prepared for Battelle Pacific Northwest Lab., Richland, Wash.
(Contract DE-AC06-76RL-01830)
(PNL-3668) Avail: NTIS HC A07/MF A01

A supplement to the wind energy resources atlas for the Great Lakes region is presented. It incudes a detailed discussion of the methodologies and data employed to complete the atlas. A summary of the regional annual average wind power is given, highlighting the major wind resource areas. DOE

N81-30752# GEOMET, Inc., Gaithersburg, Md.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE SOUTHEAST REGION
J. Zabransky Jan. 1908 138 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3669) Avail: NTIS HC A07/MF A01

Techniques developed to assess the wind energy resource in the Southeast are described. Wind data locations were identified and the data obtained were screened. Summarized data were processed and wind power values were estimated for all data locations. Upper air data were used to estimate wind power on mountaintops and ridge crests. Maps of annual and seasonal wind power classes were constructed from the computed wind power values along with the aid of landform and shaded relief maps. It is concluded that various topographic and landform features can be associated with high or low wind power. DOE

N81-30753# Western Scientific Services, Inc., Fort Collins, Colo.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE SOUTHERN ROCKY MOUNTAIN REGION
D. L. Freeman and S. R. Anderson Apr. 1981 97 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3671) Avail: NTIS HC A05/MF A01

The development of a regional wind energy resource atlas for the Southern Rocky Mountain region, which consists of Arizona, Colorado, New Mexico, and Utah is discussed. Observational and analytical techniques used in the development of the Southern Rocky Mountain region's wind energy resource atlas are described. DOE

N81-30754# Global Weather Consultants, Inc., San Jose, Calif.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN THE SOUTHWEST REGION
R. L. Simon and G. T. Norman Dec. 1980 43 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3672) Avail: NTIS HC A03/MF A01

The methodology used to generate the resource assessment and the results obtained are discussed in a manner useful and instructive to other professionals in the wind resource assessment field. DOE

N81-30755# Hawaii Univ., Honolulu. Dept. of Meteorology.
TECHNIQUES FOR ASSESSING THE WIND ENERGY RESOURCE IN HAWAII AND PACIFIC ISLANDS REGION Final Report
T. A. Schroeder Aug. 1980 42 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3673; UHMT-80-04A) Avail: NTIS HC A03/MF A01

The procedures utilized in preparing the Wind Energy Resource Atlas for Hawaii and Pacific Islands Region are contrasted with those used in other regional assessments. Techniques generally paralleled those of the northwest wind resource assessment. Quality of data bases differed drastically between Hawaii and the Pacific Islands. Research data sets constituted a primary data source for Hawaii, but such sets were nonexistent for the Pacific Islands. Forest Service data had minor impact in Hawaii; none in the Pacific Islands. Many Pacific Island anemometers are poorly exposed since limited open spaces exist on small atolls. DOE

N81-30756# Nevada Univ., Reno. Atmospheric Sciences Center.
ICING ON WIND-ENERGY SYSTEMS
Thomas Hoffer, Tony Reale, and Ashraf Elfigi Jan. 1981 74 p refs
(Contract DE-AC06-79ET-23170)
(DOE/ET-23170/80/1) Avail: NTIS HC A04/MF A01

Procedures for analyzing data to determine the maximum possible icing to be expected at specified locations are reported. The procedures for predicting maximum glaze ice and rime are presented in separate sections. Models that simulate the maximum possible ice building on an exposed surface using the rainfall and cloud water data as input are presented. The maximal dynamic and static icing loads, comparative icing values based on actual field conditions simulations are shown. Assumptions of droplet splashing and water drainage for the glaze cases and atmospheric mixing during orographic lifting for rime cases are included. DOE

N81-30757# New Mexico State Univ., University Park. Physical Science Lab.
ASSESSING THE LOCAL WIND FIELD AT SIERRA GRANDE MOUNTAIN IN NEW MEXICO WITH INSTRUMENTATION
K. M. Barnett and R. D. Reynolds 1958 116 p refs Sponsored by DOE Prepared for Battelle Pacific Northwest Labs., Richland, Wash.
(PNL-3623) Avail: NTIS HC A06/MF A01

Operation of an instrumented wind speed and direction measurement data acquisition program at several locations on the mountain is described. Operating problems are discussed, a cost estimate presented, and data obtained during the six month program analyzed. Estimated energy output of a large wind energy conversion system (WECS) located on the eastern side of the peak is presented. Changes in methodology for similar measurement operations at potential WECS sites are recommended. DOE

N81-30758# Illinois State Water Survey, Urbana. Meteorology Section.
HYGROSCOPIC SEEDING OF CONVECTIVE CLOUDS Final Report
David B. Johnson 30 Sep. 1980 229 p refs Sponsored by the Dept. of the Interior
(PB81-187908; SWS-CR-244) Avail: NTIS HC A11/MF A01 CSCL 04B

Results of over 10,000 separate computer runs investigatng the possible effects of hygroscopic seeding on the time or location of the initial development of precipitation in convective clouds are reported. Hygroscopic seeding is a 'brute force' technique, requiring massive quantities of seeding material to force any significant changes in rain initiation. GRA

N81-30759# Royal Netherlands Meteorological Inst., De Bilt.
YEARBOOK A: METEOROLOGY, VOLUME 131 Annual Report, 1979
1980 74 p In ENGLISH and DUTCH
(KNMI-97-131) Avail: NTIS HC A04/MF A01

Observations made at 47 meteorological stations in the Netherlands during 1979 are tabulated. Geographical details of the stations and the position of the instruments are given. Daily recordings of air pressure, wind direction, wind velocity, temperature, relative humidity, vapor pressure, global radiation, sunshine, amount of precipitation, and duration of precipitation are tabulated and monthly and annual summaries given. Methods of observation and the instruments used are described. Author (ESA)

N81-30760# World Meteorological Organization, Geneva (Switzerland).
COMPENDIUM OF METEOROLOGY. VOLUME 2, PART 4: TROPICAL METEOROLOGY
Aksel Wiin-Nielsen and T. N. Krishnamurti 1979 446 p refs
(WMO-364-Vol-2-Pt-4) Avail: NTIS MF A01

Zonally symmetric and zonally asymmetric aspects of time-averaged tropical flows are discussed in this training aid which also presented a overview of some typical large scale tropical disturbances as well as background information on the relevant radiative processes, boundary layer processes, and convective processes that are important for understanding tropical weather systems. The sea breeze problem and diurnal changes over the tropics and concepts of tropical dynamics are discussed. Disturbances of the Atlantic, Pacific, and Indian Oceans are explored and the formation, motion, structure, and modification of typhoons are considered. Trade wind inversion and weather systems of Asia, Africa, and South and Central America are examined with emphasis on tropical rainforests, and dry areas. Phenomena of the upper troposphere and lower stratosphere are explored and cloud cover, rain fall, and satellite meteorology are considered Numerical weather predicting techniques are included. A.R.H.

N81-30761# World Meteorological Organization, Geneva (Switzerland).
FIRST GARP GLOBAL EXPERIMENT OPERATIONS REPORT SERIES. VOLUME 9: RESULTS OF SUMMER MONEX FIELD PHASE RESEARCH (PART B) Global Atmospheric Research Programme
R. L. Grossman, ed. Dec. 1980 346 p refs Prepared in cooperation with International Council of Scientific Unions, Rome
(GARP-FOR-9-Pt-B) Avail: NTIS MF A01; print copy available at WMO, Geneva

The influence of the Southern Hemisphere on the development of monsoons, and regional aspects of the summer monsoon (1979) are discussed in 28 papers. Emphasis is on the Asian landmass, the Indian Ocean, the Bay of Bengal, and the Arabian Sea. Mesoscale studies of monsoon disturbances, boundary layer studies, and intercomparison and instrument performance studies are included. A.R.H.

N81-30762# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE FIRST SESSION OF THE INTER-GOVERNMENTAL PLANNING MEETING ON ALPEX Global Atmospheric Research Programme
1981 95 p refs Presented at GENEVA, Oct. 1980 Prepared in cooperation with ICSU, Rome
(GARP-Spec-Rept-36) Avail: NTIS MF A01; print copy available at WMO, Geneva

The characteristics of the air flow and mass and moisture field over and around the Alpine mountain complex under various synoptic conditions are studied. Precipitation and the transport of atmospheric constituents including pollution are investigated. The commitments and contributions of the various participating countries are presented. Oceanography, observing systems, data management, organizational activities, operations centers, the assessment of the adequacy of the Aplex observing

system and future requirements, implementation, and envisaged activities are detailed. Author (ESA)

N81-30763# National Oceanic and Atmospheric Administration, Boulder, Colo. Center for Environmental Assessment Services.
CLIMATIC DEGREE DAYS FOR ENERGY DEMAND ASSESSMENT
Henry E. Warren, Sharon K. LeDuc, and Mary S. Joshua Nov. 1980 146 p refs
(PB81-193880; NOAA-81021901) Avail: NTIS HC A07/MF A01 CSCL 04B

The development and procedures for the use of real time heating and cooling degree days information for States is presented. These State data are determined by population weighting heating and cooling degree days data from major National Weather Service stations. The concept of a degree day index is a result of the need to monitor temperature sensitive energy consumption on a disaggregated basis. Climatological normals and ranges of heating and cooling degree days are calculated for each State and presented in tabular and graphic form to facilitate the use of operational information. GRA

N81-30764# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
ANALYSIS OF DATA FROM TWO LASER WEATHER IDENTIFIER SYSTEMS
R. Ting-i-Wang, R. Lataitis, K. B. Earnshaw, and E. Moroz Oct. 1980 25 p refs
(PB81-198517; NOAA-81031703; NOAA-TM-ERL-WPL-65) Avail: NTIS HC A02/MF A01 CSCL 04B

A technique was developed to identify weather using laser forward scattering. A detailed analysis of the performance of these systems compared to human weather observations and tipping bucket rain gauges records is given. GRA

N81-30765# National Oceanic and Atmospheric Administration, Rockville, Md.
NOAA CLIMATE PROGRAM PLAN
Jan. 1981 57 p refs
(PB81-193815; NOAA-81022305) Avail: NTIS HC A04/MF A01 CSCL 04B

The overall goal of the NOAA Climate Program is to develop and deliver improved climate data, information, and prediction services and to expand understanding of climate processes through focused physical, dynamic, and statistical climate research. Particular emphasis will be directed to studies of the impacts of natural climate variability on commercially important marine fisheries. GRA

N81-30766# National Oceanic and Atmospheric Administration, Washington, D. C. Center for Environmental Assessment Services.
THE INTERIM CLIMATE DATA INVENTORY: A QUICK REFERENCE TO SELECTED CLIMATE DATA
C. F. Ropelewski, M. C. Predoehl, and M. Platto Dec. 1980 180 p
(PB81-198764; NOAA-81030201) Avail: NTIS HC A09/MF A01 CSCL 04B

This catalog was produced as part of the efforts of the Environmental Data and Information Service in the National Climate Program. Its primary purpose is the distribution of information collected at the Climate Data Management Workshop held in Harpers Ferry, West Virginia in May 1979. These are: basic atmospheric data, hydrology, precipitation, snow, ocean data, radiation, physics, and chemistry, proxy and noninstrumental data resources, geographical, land use, and assessment data. GRA

N81-30767# Meteorology Research, Inc., Altadena, Calif.
MICROPHYSICS OBSERVATIONS OF CONVECTIVE CLOUDS IN THE TEXAS HIPLEX AREA Technical Memo, Mar. - May 1980
D. M. Takeuchi 21 Jul. 1980 71 p refs
(Contract DI-14-06-D-7699)
(PB81-186801; MRI-80-TM-1765) Avail: NTIS HC A04/MF A01 CSCL 04B

The roles of several microphysics processes are evaluated. Two basic cloud types are considered: (1) solated comgestus clouds and (2) feeder clouds associated with frontal systems or with mesoscale storm systems forming. In time evolution of cloud particle mass density vs. particle size at cloud levels between -5 to -10 C, is characterized by bimodal distributions, a signature of precipitation initiation by the warm rain process. The development of the ice phase is similar to that for other geographical locations. Aside from their initial appearances along the visible cloud edges and/or in downdraft regions, the Mossop-Hallet ice multiplication process is also indicated. The major difference between the two cloud types is that, in the larger clouds, the role of recycling of the large precipitation particles dominate and result in increased precipitation efficiency. GRA

N81-30768# Transportation Systems Center, Cambridge, Mass.
IMPACT OF NEXRAD USER REQUIREMENTS, SUMMARY Final Report, Oct. 1980 - Jan. 1981
Lloyd Stevenson, Philip Bloom, and Paul Rempfer Feb. 1981 43 p refs Sponsored in part by National Weather Service
(PB81-188393; DOT-TSC-VV-81-1) Avail: NTIS HC A03/MF A01 CSCL 04B

The results of an analysis of the impact of data acquisition rate and spacial data resolution, conducted for the NEXRAD joint system program office are reported. The analysis includes results from the NEXRAD Radar Data Acquisition subsystem's availability, reliability, and maintainability. GRA

N81-30769# Water and Power Resources Service, Denver, Colo.
HIPLEX RAWINSONDE SKEW T-LOG P ANALYSES, 1977 Report, May - Jul. 1977
David A. Matthews and Francis E. Politte Dec. 1980 185 p refs
(PB81-194441) Avail: NTIS HC A09/MF A01 CSCL 04B

Thermodynamic analyses of stability and moisture for all HIPLEX rawinsonde observations were plotted on skew T-log P diagrams and wind vectors plotted at mandatory levels. Soundings were observed at Miles City and Billings, Montana, and four mesoscale network sites near Big Spring, Texas. Soundings were observed at Goodland, Kansas, and South Park, Colorado. Method of observation, data reduction techniques, and available analysis software are documented. GRA

N81-30770# Illinois State Water Survey, Urbana.
REVIEW OF ILLINOIS SUMMER PRECIPITATION CONDITIONS
Stanley A. Changnon, Jr. and Floyd A. Huff 1980 166 p refs
(PB81-180523; ISWS/BULL-64/80) Avail: NTIS HC A08/MF A01 CSCL 04B

Key findings are summarized regarding all aspects of precipitation in the convective season taken from 30 years of research at the Illinois State Water Survey. Examples of information that dimensionalize midwestern precipitation phenomena, included: general climatic aspects; rainfall relations to atmospheric conditions; organized storms and substorm entities; vertical and horizontal characteristics of individual storm cells; and cloud characteristics and frequencies. GRA

N81-30771# Meteorology Research, Inc., Altadena, Calif.
A CASE STUDY OF THE CLOUD BASE REGIONS OF THE SINGLE-CELLED HIPLEX STORM OF 27 MAY 1977
D. M. Takeuchi Oct. 1980 43 p refs
(Contract DI-14-06-D-7699)
(PB81-185100; MRI-80-R-1787) Avail: NTIS HC A03/MF A01 CSCL 04B

Aircraft and weather radar measurements collected during the life cycle of an evolving thunderstorm in the Miles City HIPLEX area were analyzed. Distinguishing features determined from the radar included (1) storm domination by a single cell, (2) storm movement from a constant direction and to the right of the mean cloud bearing layer winds, (3) maximum echo tops and intensities of 11 km and 50-53 dBz, respectively. Environmental conditions and possible mechanisms leading to the observations are presented. GRA

N81-30772# Meteorology Research, Inc., Altadena, Calif.
A CASE STUDY OF A SEEDED MULTIPLE-SURGE CLOUD COMPLEX Technical Report, Jan. 1978 - Dec. 1979

Gerald J. Mulvey and Mark E. Humbert 10 Sep. 1980 82 p refs
(Contract DI-14-06-D-7699)
(PB81-186793; MRI-80-R-1722) Avail: NTIS HC A05/MF A01 CSCL 04B

The series of events before, during and after the seeding of a cloud complex in west Texas as part of the 1978 HIPLEX experiment are described. Aircraft and radar data interpretation in describe the cloud processes are emphasized. The results of this study were used to explore the precipitation mechanisms and the seeding hypothesis for convective (thunderstorm) complexes. This is shown, while the individual processes in the hypothesis were observed, it cannot be concluded that the changes in the cloud were due to seeding. GRA

N81-30773# Meteorology Research, Inc., Altadena, Calif.
TEXAS HIPLEX 1979: MRI (METEOROLOGY RESEARCH, INC.) NAVAJO CLOUD PENETRATION DATA VOLUME
G. J. Mulvey 2 Oct. 1980 136 p
(Contract DI-14-06-D-7699)
(PB81-186819; MRI-80-DV-1760) Avail: NTIS HC A07/MF A01 CSCL 04B

Significant cloud penetration data collected by the MRI aircraft summertime HIPLEX field season are summarized. Time histories of selected measured and computer quantities as well as ground track position plots are summarized. The data tapes which contain the cloud penetration measurements are cross referenced with each particular cloud for easy retrieval. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N81-30774 Michigan Univ., Ann Arbor.
DETERMINATION OF WIND STRESS FROM WATER LEVEL FLUCTUATIONS Ph.D. Thesis
David John Schwab 1981 117 p
Avail: Univ. Microfilms Order No. 8116331

An inverse method is tested in several ideal cases and is applied to observations of Lake Erie water levels and over-water wind to compute over-water drag coefficients. The method is based on the linearized, vertically-integrated shallow water equations with rotation and friction terms. It is shown that the free surface fluctuation can be expressed as the convolution integral of time and space dependent wind stress with a response function kernel. An explicit form for the response function in terms of the normal modes of the system is given. If wind stress is taken as the unknown and water level fluctuation as a prescribed quantity, the integral equation relating them does not have a unique solution. However, it is shown that, with some reasonable assumptions about the spatial variability of the wind stress field, a unique solution for wind stress in terms of water level fluctuations can be obtained. Dissert. Abstr.

N81-30775# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SHORT TERM VARIATIONS OBSERVED IN THE CIRCULATION HEAT CONTENT AND SURFACE MIXED LAYER OF AN UPWELLING PLUME OFF CABO NAZCA, PERU
Merritt Raymond Stevenson, David W. Stuart (Florida State Univ., Tallahassee), and George W. Heburn (Florida Univ., Tallahassee) Jul. 1981 27 p refs Presented at the IDOE Intern. Symp. on Coastal Upwelling, Los Angeles, 4-8 Feb. 1980 Submitted for publication
(INPE-2188-RPE/001) Avail: NTIS HC A03/MF A01

Direct measurements of local horizontial current flow within a cool surface plume were made with drogue floats during joint 2 investigations. Detailed use of the trajectory data provided an opportunity to estimate horizontal divergence within the upper 4 m of the plume and on one occasion to 10 m depth. STD casts from a Lagrangian time series were used to estimate the thickness of the mixed layer depth and vertical stability within and adjacent to the plume. These determinations suggest that while limited to a thin surface layer, the upwelling velocity within the plume over 6 hour intervals may be considerable, although 24 hour values of w may average 2x10 sq cm/sec. Because of the isotherm changes observed in the nearly daily sea surface temperature charts for the plume, the daily insolation and heat content in the upper water column within the plume were calculated and results were compared to the horizontal and vertical motion in the plume. A.R.H.

N81-30776# Lamont-Doherty Geological Observatory, Palisades, N. Y.
ARCTIC OCEAN EDDIES AND BAROCLINIC INSTABILITY Technical Report, Mar. - May 1981
Kenneth Hunkins Jul. 1981 46 p refs
(Contract N00014-76-C-0004)
(AD-A101620; LDGO-CU-81) Avail: NTIS HC A03/MF A01 CSCL 08/3

Baroclinic eddies with diameters of about 10 km and maximum current speeds of about 50 cm/s have been widely observed in the central Arctic Ocean north of Alaska and Canada. The possible origin of these eddies through an instability of the mean baroclinic flow is investigated using an ocean model with exponential profiles of mean shear and Vaisala frequency. The model includes Ekman pumping at a rigid bottom and at either a free or rigid upper surface. The central Arctic Ocean where the eddies were found is baroclinically stable with no possibility of eddy production. On the periphery of the Arctic Ocean north of Alaska the combination of greater current shear, shallower depth and lack of ice cover leads to unstable conditions and the eddies apparently originate in that region. The instability theory predicts maximum velocity at the surface instead of below the surface as observed. Apparently after formation in open water the eddies are advected beneath the ice cover and dissipate the momentum of their upper layers against the ice. This is demonstrated by calculations for the diffusion of vorticity against the ice in the case of an initial exponential profile. A subsurface maximum then develops which resembles the observed profiles. Author (GRA)

N81-30777# Columbia Univ., Palisades, N.Y. Geological Observatory.
CORAL GROWTH RINGS AND THE TEMPORAL HISTORY OF NUCLEAR 14 C/C 90Sr/Sr IN THE SURFACE OCEAN Progress Report, 1 Feb. 1980 - 31 Jan. 1981
W. S. Broecker and Richard G. Fairbanks Sep. 1980 95 p refs
(Contract DE-AC02-76ER-02271)
(DOE/ER-02271/T1) Avail: NTIS HC A05/MF A01

Coral growth samples were collected from the Atlantic, Pacific, and Indian Oceans. Three Strontium 90 records, one each from Bermuda, Oahu, and Tarawa were generated. Models were constructed and tested which are used to reproduce the essential features of the coral Sr-90 and C-14 time histories. DOE

N81-30778# California Univ., Livermore. Lawrence Livermore Lab.
GEOHYDROLOGY OF ENEWETAK ATOLL ISLANDS AND REEFS
Robert W. Buddemeier 6 May 1981 17 p refs Presented at the 4th Intern. Coral Reef Symp., Manila, 18-22 May 1981
(Contract W-7405-eng-48)
(UCRL-85411; CONF-810547-1) Avail: NTIS HC A02/MF A01

Extensive tidal studies in island wells and the lagoon at Enewetak Atoll show that island ground water dynamics are controlled by a layered aquifer system. The surface aquifer of unconsolidated Holocene material extends to a depth of approximately 15 m, and has a hydraulic conductivity K = 60 m/day. From 15 to 60 m (approximate lagoon depth) the reef structure consists of successive layers of altered Pleistocene materials, with bulk permeability substantially higher than that of the surface aquifer. Because of wave set-up over the windward reef and the limited pass area for outflow at the south end of the atoll, lagoon tides rise in phase with the ocean tides but fall later than the ocean water level. This results in a net lagoon-to-ocean head which can act as the driving force for outflow through the permeable Pleistocene aquifer. DOE

N81-30779# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.

PHYSICAL OCEANOGRAPHIC AND METEOROLOGICAL CONDITIONS IN THE NORTHWEST GULF OF ALASKA
Robin D. Muench and James D. Schumacher Oct. 1980 161 p refs
(PB81-199473; NOAA-81031702; NOAA-TM-ERL-PMEL-22)
Avail: NTIS HC A08/MF A01 CSCL 08C

A summary is presented of the major findings of Outer Continental Shelf Environmental Assessment Program research into physical oceanographic conditions in the northwest Gulf of Alaska. The emphasis is on circulation features, since water circulation plays a major role in the path and dispersal of surface contaminants, a problem of major impetus for the OCSEAP program. Combined with knowledge of the local and regional wind field, this allows at least an approximate predictability of contaminant dispersion and trajectory. GRA

N81-30780# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Marine Pollution Assessment.
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: REPORTS OF PRINCIPAL INVESTIGATORS. VOLUME 1: REACTORS - BIRDS, PLANKTON, LITTORAL, BENTHOS Annual Reports
1980 815 p refs Sponsored in part by Bureau of Land Management 3 Vol.
(PB81-196263) Avail: NTIS HC A99/MF A01 CSCL 08A

Simulation modeling of marine bird population energetics, food consumption, and sensitivity to perturbation was performed. Shorebird dependence on Arctic: littoral habitats was studied as well as the distribution, abundance, and feeding ecology of birds associated with pack ice. A study of the population numbers and productivity of colonial seabirds is included. Plankton studies in the Bering Sea and an environmental assessment of selected habitats in the Arctic littoral system are also included. The distribution, abundance, community structure, and trophic relationships of the benthos of the Northeastern Gulf of Alaskan from Yakutat Bay to Cross Sound and the distribution, abundance, diversity, and productivity of the Western Sea benthos were studied. E.D.K.

N81-30781# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Marine Pollution Assessment.
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: REPORTS OF PRINCIPAL INVESTIGATORS. VOLUME 2: RECEPTORS MICROBIOLOGY, ECOLOGICAL PROCESSES Annual Reports
1980 521 p refs Sponsored in part by Bureau of Land Management 3 Vol.
(PB81-196271) Avail: NTIS HC A22/MF A01 CSCL 08A

Potential interactions of microorganisms and pollutants resulting from petroleum development on the outer Continental Shelf of Alaska were assessed. Microbial activity and crude oil/microbial interactions in the waters and sediments of Cook inlet and the Beaufort Sea were studied. E.D.K.

N81-30782# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Marine Pollution Assessment.
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: REPORTS OF PRINCIPAL INVESTIGATORS. VOLUME 3: EFFECTS AND CONTAMINANT BASELINES Annual Report
1980 359 p refs Sponsored in part by Bureau of Land Management 3 Vol.
(PB81-196289) Avail: NTIS HC A16/MF A01 CSCL 08A

Lethal and sublethal effects on selected Alaskan marine species after acute and long term exposure to oil and oil components were studied. Sublethal effects of petroleum hydrocarbons and trace metals, including biotransformations, as reflected by morphological, chemical, physiological, pathological, and behavioral indices were examined. GRA

N81-30783# Continental Shelf Associates, Tequesta, Fla.
VIDEO AND PHOTOGRAPHIC RECONNAISSANCE OF PHLEGER AND SWEET BANKS, NORTHWEST AND GULF OF MEXICO Final Report
Aug. 1980 29 p refs
(Contract DI-AA551-CT9-36)
(PB81-189318, BLM/YM/ES-80/9) Avail: NTIS HC A03/MF A01 CSCL 08A

The reconnaissance was conducted for the purpose of documenting the associated biota prior to the potential leasing of oil and gas tracts that contain the banks within their boundaries. The hard bottom biota associated with the surveyed depths of 122 to 173 meters on Phleger Bank included sponges, comafluid crinoids, paramuricid gas fans, spiral sea whips Cirrhipathes sp., and the Roughtonguebass, Holanthias martinicensis. GRA

N81-30784# JAYCOR, Alexandria, Va.
PHYSICAL OCEANOGRAPHIC MODEL EVALUATION FOR THE SOUTH ATLANTIC OCS REGION Final Report
Dec. 1980 337 p refs
(Contract DI-AA551-CT8-34)
(PB81-184095; BLM/YM/ES-80/10) Avail: NTIS HC A15/MF A01 CSCL 08C

The objective of the evaluation was to determine which models, if any, were best suited to the program needs in assessing the distribution of pollutants resulting from offshore activities. Emphasis is placed on models that can assess the probability of occurence of circumstances hazardous to offshore structures. T.M.

N81-30785# Nebraska Univ. - Lincoln. Dept. of Geography.
EASTERN NORTH PACIFIC SEASONAL SEA SURFACE TEMPERATURE DEPARTURE, 1931-1977
Arthur V. Douglas and Philip J. Englehart Sep. 1980 98 p refs
(Grant NSF OCE-78-08481)
(PB81-187916; NSF/IDOE-81-1; OP-5) Avail: NTIS HC A05/MF A01 CSCL 08J

Seasonal sea surface temperature departures in the eastern North Pacific Ocean are presented in this atlas. All available ship reports were processed for the period 1900 to present. Poor data coverage prior to 1931 precluded the construction of reliable maps for the early 1900's. Consequently, this atlas only includes anomaly charts for the period 1931 to 1977. The departures are based on a 23 year mean from 1949 to 1971. The areal coverage of this atlas is restricted to the zone from 20 degrees N to 40 degrees N. GRA

N81-30786# Texas A&M Univ., College Station. Dept. of Oceanography.
GULF OF MEXICO INFORMATION TRANSFER MEETING PROCEEDINGS Final Report, 1980
Oct. 1980 72 p refs Meeting held at New Orleans, 12-13 May 1980
(Contract DI-AA551-CT8-35)
(PB81-189300; BLM/YM/ES-80/8; TR-80-T-11) Avail: NTIS HC A04/MF A01 CSCL 08J

Data and information for preparing Environmental Impact Statements and Assessment Reports include: environmental impact studies; marine biology; marine geology; archeology; physical oceanography; oil and gas leases; and water chemistry. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N81-30787 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Frankfurt am Main (West Germany). Abt. Biophysik.
EFFECTS OF ACCELERATED HEAVY IONS ON BACILLUS SUBTILIS SPORES: INACTIVATION, REPAIR AND MUTATION INDUCTION
G. Horneck and H. Buecker 1979 11 p Presented at Spore Radiobiol. Meeting, Tokyo, 20 May 1979
Avail: NTIS HC A02

The validity of the assumptions that, if a particle of linear energy transfer (LET) of more than 2,000 MeV sq cm/g hits a spore protoplast, repair of the damage produced will not be possible, nor will a mutation arise, was tested by exposing Bacillus subtilis spores to heavy ions (boron, carbon, neon) at different LET values. The reparability of the damage produced, and the frequency of induced mutations were determined (formation of visible colonies on Difco tryptose blood agar base, formation of

azide-resistant mutants on plates containing sodium azide). A series of dose survival curves for each bacterial strain, and dose effect curves for mutation induction, were obtained. The data indicate that the LET value of the heavy ion determines the kind of damage to the DNA. Below 2,000 MeV sq cm/g, reparable lesions are produced, with misrepair of such lesions being a possible explanation for high mutation induction. Above 2,000 MeV sq cm/g, irreparable lesions occur, from which mutations are unlikely to arise. Author (ESA)

N81-30788*# Rochester Univ., N. Y.
BIOCHEMICAL ASSAYS OF CULTURED CELLS Final Annual Report, 1 Jun. 1980 - 31 Mar. 1981
Grant H. Barlow (Michael Reese Research Foundation, Chicago) 31 Mar. 1981 14 p
(Contract NAS9-16187)
(NASA-CR-161079) Avail: NTIS HC A02/MF A01 CSCL 06C

Assay systems were developed for use in interpreting samples to be returned on the space shuttle OFT-3 flights. Samples from electrophoretic separation were used to evaluate the techniques. All assays were determinable on the growth media. Approaches are described for assaying: (1) the human granulocyte conditioning factor; (2) urokinase activity; (3) erythropoietin; (4) the molecular form of urokinase; and (5) protein distribution. Other studies are planned to validate that the activity observed is urokinase and not that of other activators or proteases. A.R.H.

N81-30789# Argonne National Lab., Ill. Energy and Environmental Systems Div.
POTENTIAL HEALTH AND SAFETY IMPACTS FROM DISTRIBUTION STORAGE ALCOHOL FUELS
S. E. Rosenberg and J. R. Gasper Jun. 1980 33 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV/TM-61) Avail: NTIS HC A03/MF A01

Literature on the health and safety aspects of the neat alcohols, alcohol-gasoline blends, and typical gasoline are discussed. The toxic properties of each fuel type are identified. Existing standards and regulations are described. The major safety and health risks that would result from the increased use of each type of alcohol fuel are identified. Potential accidents are described and their probable impacts on occupational and public populations are determine. An attempt is made to distill the important health and safety issues and to define gaps in our knowledge regarding alcohol fuels to highlight the further research needed to circumvent potential health and safety problems. DOE

N81-30790# Oak Ridge National Lab., Tenn. Biology Div.
NOVEL APPROACH TO THE GROWTH OF ANAEROBIC MICROORGANISMS
H. I. Adler and W. D. Crow 1981 19 p refs Presented at 3rd Symp. of Biotechnol. in Energy Production and Conservation, Gatlinsburg, Tenn., 12-15 May, 1981
(Contract W-7405-eng-26)
(CONF-810554-1) Avail: NTIS HC A02/MF A01

Some of the properties of the Escherichia coli membrane fraction are described. Results of a survey of its use with a variety of anaerobic bacteria under several experimental conditions are given. DOE

N81-30791# Oak Ridge National Lab., Tenn. Chemical Technology Div.
VOLUME REDUCTION OF SOLID WASTE BY BIOLOGICAL CONVERSION OF CELLULOSICS
G. W. Strandberg Jun. 1981 20 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7653) Avail: NTIS HC A02/MF A01

The degradius of the types of cellulosic wastes generated in an anaerboic bioreactor was demonstrated. The rate and extent of anaerobic microbial digestion of blotter, paper, cloth, sanitary napkins, and pine sawdust in various types and sizes of bench scale anerobic bioreactors are described. It is indicated that the resulting digests are amenable to incorporation into hydrofracture grouts. DOE

N81-30792# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Frankfurt am Main (West Germany). Abteilung Biophysik.
RESPONSE OF BACILLUS SUBTILIS SPORES TO HEAVY ION IRRADIATION USING CELLULOSE NITRATE DETECTORS
M. Schaefer, R. Facius, and H. Buecker 1980 7 p refs
Avail: NTIS HC A02/MF A01

Cellulose nitrate sheets carrying the spores of Bacillus subtilis were irradiated with accelerated iron ions under Biostack conditions. The initial energy on the top of the stack was 250 MeV/n with a fluence of 1,000-10,000 particles/sq cm. The energy of the particles for evaluation within the stack varied from 100 MeV/n to 150MeV/n. A second experiment was performed using argon ions and an energy of 1.4 MeV/n. The spores were incubated directly on the surface of the detector foil, and the outgrowth of individual spores around one single track was observed after different incubation times and was documented by microphotography. For values below 1 micron, a steep decrease of K prime was observed. At higher impact parameters, K prime exceeds the control level in two regions around 1.3 microns and 3 microns with regions of average control survival in between. Author (ESA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N81-30793# Environmental Protection Agency, Research Triangle Park, N.C. Health Effects Research Lab.
TUMORIGENESIS OF DIESEL EXHAUST, GASOLINE EXHAUST, AND RELATED EMISSION EXTRACTS ON SENCAR MOUSE SKIN
Stephen Nesnow, Larry L. Triplett (ORNL), and Thomas J. Slaga 1980 25 p refs Presented at the EPA 2nd Symp. on Application of Short Term Bioassays in the Analysis of Complex Environ. Mixtures, Williamsburg, Va., 4-7 Mar. 1980
(Contracts W-7405-eng-26; EPA-79-D-X0526; DOE-40-728-78)
(CONF-800323-4) Avail: NTIS HC A02/MF A01

The SENCAR mouse skin tumorigenisis bioassay for tumor initiation, a quantitative short term in vivo rodent carcinogenesis system which detects a variety of structurally diverse chemical carcinogens was examined. This bioassay system is utilized in evaluating complex environmental mixtures for tumorigenic potential. It provides dose responses with both substances and complex mixtures and is utilized for comparative potency analysis. The tumorigenicity of diesel exhaust particulate emissions was examined using SENCAR mouse skin. The tumorigenic potency of particulate emissions from diesel, gasoline, and related emission sources are compared and the tumorigenic potential of the materials is clearly indicated. E.A.K.

N81-30794# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
EXPERIMENTAL INVESTIGATIONS AND NEW INSTRUMENTATION FOR Nd:YAG LASER TREATMENT IN UROLOGY
F. Frank, A. Hofstetter (Municipal Hospital, Munich), and E. Keiditsch (Municipal Hospital, Munich) 7 Nov. 1979 16 p refs Presented at Intern. Congr. on Laser Surgery, 2nd Tutorial Gyn. Microsurg. Sem., New Orleans, 9-12 Jan. 1980
(MBB-UA-517/79-OE) Avail: NTIS HC A02/MF A01

A special laser-cystourethroscope developed for transurethral application of laser beams is described. A modified Albassen attachment, using a highly flexible quartz fiber to transmit the laser light, is depicted. The proximal end of the light conductor is used without any sealing window and can be bent through an 80 deg. arc. Since the instrument is used in a water-filled bladder, the end of the light conductor requires no special cleaning or cooling. The absorption and scattering of laser light in tissue determine the significant optical parameters, both depending on wavelength. The extinction behavior of laser light in tissue depends on the type of laser used. The performance of a Nd:YAG laser for urology applications is compared with that of argon and CO2 type lasers. The deep heating effect of the Nd:YAG laser makes it very suitable for such applications. Author (ESA)

N81-30795# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
HETEROCLINIC WAVES OF THE FITZHUGH-NAGUMO EQUATIONS
J. P. Pauwelussen Oct. 1980 25 p refs Submitted for publication
(MC-TW-209/80) Avail: NTIS HC A02/MF A01

A piecewise linear function is developed to replace the f of the Mckean treatment. The following equation is employed: f(u) equals F (-U+H(u-a)), where H is the Heavyside step function. The existence and stability of wave solutions are analyzed. In the solutions considered, U takes on the value a only once. Three typical wave forms satisfying given boundary conditions are established. The U component of the first form decreases all the time. The U component of the second form increases from U equal to 0 at x equal to minus infinity to a maximum value and then decreases towards a particular value at x equal to plus infinity. The U component of the third form oscillates around the particular U value approaching this particular value at x equals infinity. Author (ESA)

N81-30796# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ONE WAY TRAFFIC OF PULSES IN A NEURON
J. P. Pauwelussen Mar. 1981 34 p refs Submitted for publication
(MC-TW-213/81) Avail: NTIS HC A03/MF A01

The effect of a change in the geometry of a nerve axon on the propagation of potential waves along it is investigated. The existence or nonexistence of these waves depend strongly on the shape of the axon. A sudden increase in membrane area ahead of the wave causes the membrane current to fall. As a result the action potential decreases temporarily; if this potential falls below a certain threshold the wave may be stopped. An analytical method is proposed to study these phenomena. A tree-shaped neuron of infinite extension is employed. The results obtained are also valid for population genetics and chemical reaction theory. Author (ESA)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N81-30797# Southampton Univ. (England). Hearing Conservation Unit.
A MICROCOMPUTER BASED FACILITY FOR PSYCHOACOUSTIC EXPERIMENTATION
R. J. Halford, P. A. Wilkins, and A. M. Martin Aug. 1980 57 p refs Sponsored by Health and Safety Executive
(ISVR-TR-109) Avail: NTIS HC A04/MF A01

A microcomputer based experimental facility was developed to investigate the effects of wearing hearing protection on the perception of warning sounds. The microcomputer acts as a process controller and a data logger. The facility is capable of presenting complex sound stimuli to subjects from cassette tape recordings, or pure tones generated by a synthesizer. The intensities of the sound stimuli and a background noise can be separately varied over a 70 dB range. The facility also includes a range of loading tasks derived from a television game integrated circuit chip. During the course of an experiment the computer controls the time of presentation and intensity of the sound stimuli, and the operation of the loading task. It also logs data of the presentation of the sound stimuli, the subject's responses to the stimuli, and the subject's performance at the loading task. It is possible to analyze the data using the microcomputer or by feeding it via paper tape to other computers.Author (ESA)

N81-30798# National Bureau of Standards, Washington, D.C. National Engineering Lab.
CRITERIA FOR RECOMMENDING LIGHTING LEVELS
Gary T. Yonemura Mar. 1981 57 p refs Sponsored in part by DOE
(PB81-185126; NBSIR-81-2231) Avail: NTIS HC A04/MF A01 CSCL 05J

The effect of lighting on behavior which ranges from allowing simple detection of objects to creating moods and impressions was studied. Lighting standards and recommendations for general applications should be based on the visibility requirements where differences between individuals are minimal. It is recommended that conspicuity be the metric for visibility. Subjective visual response criteria should be treated as design options to be applied when they are important aspects of the intended function of the space. The major categories of variables in the perception of the visual environment are presented and organized logically with respect to their relationship in developing lighting criteria and standards. A breakdown of the visual processes into sensory and perceptual components is analyzed. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N81-30799# Whitston Associates, Pasadena, Calif.
ASSESSMENT OF THE USE OF HUMAN FACTORS IN THE DESIGN OF FOSSIL-FIRED STEAM-GENERATING SYSTEMS Final Report
J. A. Oliver, J. E. Baker, and J. W. Roth Apr. 1981 119 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 1266-20)
(EPRI-CS-1760) Avail: NTIS HC A06/MF A01

A method was developed to evaluate the level of implementation of established human factors data and principles in the design of a present or future fossil fired power plant. The methodology is based on knowing the distribution of human error between three generic locations within the plant and the importance of regarding their impact on the performance of operating and maintenance personnel in generic plant locations. a mathematical expression was developed whereby scores, corresponding to the level of implementation of the selected Human Factors Variables could be assigned. This evaluation technique was applied to three modern fossil fired steam generating systems for verificaton of its adequacy. Results are presented of comparisons of the three fossil fired steam generating systems to both the electric utility industries and all industries use of human factors data and principles during plant design. DOE

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N81-30800# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
BIOCHEMICAL CHROMOPHORES AND THE INTERSTELLAR EXTINCTION AT ULTRAVIOLET WAVELENGTHS
Fred Hoyle and N. Chandra Wickramasinghe 1980 11 p refs Avail: NTIS HC A02/MF A01

The existence of bacteria and viruses in interstellar matter is suggested. An average spectrum for interstellar microbes was computed by adding the available ultraviolet spectra over 1900 A for an appropriate selection of organic molecules. The calculated mean absorption curve and astronomical data over the waveband 1900-2800 A agree closely, strongly supporting the contention that chromophores in biomolecules dominate interstellar absorption at these wavelengths. Author (ESA)

N81-31074*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SETI PROGRAM PLAN AND INSTRUMENT DEVELOPMENT STATUS
A. L. Berman and R. B. Crow *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 10-17 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 03B

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N81-30801# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROGRAMMABLE DIGITAL MEMORY CASSETTE [MEMORIA DIGITAL CASSETE PROGRAMAVEL]
Apr. 1981 115 p refs *In* PORTUGUESE; ENGLISH summary
(INPE-2047-TDL/051) Avail: NTIS HC A06/MF A01

The fundamentals of a peripheral equipment model of the magnetic memory type to be configurated in computational systems are proposed. This peripheral equipment consists, in part, of a microcomputer which was designed and constructed to be employed in the dedicated control of up to eight units of cassette digital memory. The model and the operational programming of the controller are also presented. M.G.

N81-30802# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RELATIONAL DATA BANK FOR B6700/6800 COMPUTERS [BANCO DE DADOS RELACIONAL PARA COMPUTADORES B6700/6800]
Paulo Cesar Pereira Guerra, Jose Oscar Machado Alexandre, Antonio Luz Furtado, Olga Maria Oliveira, and Celso deRennaeSouza Apr. 1981 48 p refs In PORTUGUESE; ENGLISH summary
(INPE-2043-RPE/296) Avail: NTIS HC A03/MF A01

The Relational System designed for Burrough's machines (series 6000/7000) is described. The system implements multipurpose relational data base in the Burrough's environment using the data base management system software package, DMS 2, as a support tool. It offers to users a high level nonprogramatic query language, called SEQUEL2/QS, and usual programmatic languages as COBOL, ALGOL, and PL/1. M.G.

N81-30803# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A MICROCOMPUTER FOR A DATA COLLECTION PLATFORM M.S. Thesis - 22 Dec. 1980 [UM MICROCOMPUTADOR PARA UMA PLATAFORMA DE COLETA DE DADOS]
Jose Bianchi Neto May 1981 120 p refs In PORTUGUESE; ENGLISH summary
(INPE-2074-TDL/054) Avail: NTIS HC A06/MF A01

A microcomputer model to be utilized as a unit for acquisition, control, storage, processing, and communication of data and signals with a self timed data collection platform is proposed. In particular, this model was applied in the development of a microcomputer for the GOES System. The block diagrams and the main routines fluxograms executed by the microcomputer are also presented. M.G.

N81-30804# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FUNDAMENTALS OF NUMERICAL ANALYSIS FOR DIGITAL COMPUTERS [FUNDAMENTOS DE ANALISE NUMERICA PARA COMPUTADORES DIGITAIS]
Carlos Jose Zamlutti Nov. 1980 204 p refs In PORTUGUESE; ENGLISH summary
(INPE-1937-MD/005) Copyright. Avail: NTIS HC A10/MF A01

The elements of mathematics and the fundamentals of data processing, for use with computers of any size, are presented. J.D.H.

N81-30805# Stanford Linear Accelerator Center, Calif.
TWO WORD CAMAC I/O MODULE
L. L. Barker May 1981 3 p refs
(Contract DE-AC03-76SF-00515)
(SLAC-TN-81-2) Avail: NTIS HC A02/MF A01

The two Word I/O subsystem and its operating characteristics are described. The SLAC drawings in the 962 to 306 series support this device and should be referenced for construction and connection details. DOE

N81-30806# Los Alamos Scientific Lab., N. Mex.
APPLICATION OF PARALLEL PREPROCESSORS IN DATA ACQUISITION
H. S. Butler, M. D. Copper, R. A. Williams, E. B. Hughes, J. R. Rolfe, S. L. Wilson, and H. D. Zeman 1981 8 p refs Presented at the Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Oak Ridge, Tenn., 28-30 May 1981 Sponsored in part by NSF Prepared in cooperation with Stanford Univ., Calif.
(Contract W-7405-eng-36)
(LA-UR-81-1640; CONF-810523-6) Avail: NTIS HC A02/MF A01

A data acquisition system was developed which makes use of four microprocessors running in parallel to acquire and preprocess data from 432 photomultiplier tubes (PMT) attached to 396 NaI crystals. The microprocessors are LSI-11/23s operating through CAMAC auxiliary crate controllers (ACC). Data acquired by the microprocessors are collected through a programmable branch driver (MBD) which also reads data from 52 scintillators and 728 wires comprising a drift chamber. The MBD will transfer data from each event into a PDP-11/44 for further processing and taping. The microprocessors perform the secondary function of monitoring the calibration of the NaI PMTs. DOE

N81-30807# California Univ., Berkeley. Lawrence Berkeley Lab.
OPERATING EXPERIENCE WITH A NEW ACCELERATOR CONTROL SYSTEM BASED UPON MICROPROCESSORS
S. Magyary, H. Lancaster, F. Selph, M. Fahmia, C. Timossi, J. Glatz, A. Ritchie, J. Hinkson, R. Benjegerdes, and D. Brodzik Mar. 1981 4 p refs Presented at the IEEE Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract W-7405-eng-48)
(LBL-11724; CONF-810314-165) Avail: NTIS HC A02/MF A01

The design and operating experience with a high performance control system tailored to the requirements of the SuperHILAC accelerator are described. A large number (20) of the latest 16 bit microcomputer boards are used in a parallel distributed manner to get a high system bandwidth. Because of the high bandwidth, software costs and complexity are significantly reduced. The system by its very nature and design is easily upgraded and repaired. Dynamically assigned and labeled knobs, together with touch panels, allow a flexible and efficient operator interface. An X-Y vector graphics system provides for display and labeling of real time signals as well as general plotting functions. This control system allows attachment of a powerful auxiliary computer for scientific processing with access to accelerator parameters. DOE

N81-30808# Rolls-Royce Ltd., Derby (England).
THE IMP DATALOGGER: A MIDGET WITH REMARKABLE FEATURES
A. Brown 1980 7 p
(PNR-90057; Trans-15337) Avail: NTIS HC A02/MF A01

A multifaceted microprocessor controlled and freely programmable data recording system is described. It provides a means for recording and maintaining measurement data without expensive computer support. A plug-in frame holds up to 16 input or output cards. It can be switched between analog or digital input or output. It operates with up to 128 input or output

points. An on-line printer records the measurement values and prints special characters to indicate faults and limits which were exceeded. Results and programs can be magnetically stored and recalled at any time. Fields of application include quality control, measurements at sea, peripheral systems and outdoor measurements. Author (ESA)

N81-30809# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Dynamics Div.
COMPUTER AIDED, AUDIOVISUAL INSTRUCTION FOR WEAPON TRAINING APPLICATIONS
Lothar Mueller 1 Oct. 1980 12 p
(MBB-UA-550/80-OE) Avail: NTIS HC A02/MF A01

Instruction covering all aspects from general understanding through logistics and maintenance procedures to actual application drill is discussed. A major part of this training can be efficiently enhanced by computer aided instruction extending from the checking of basic knowledge to supporting training simulation. The implementation of the Microcomputer Organized Instruction System (MORIS) for such applications is discussed. As the matter to be learned is not stored in the computer, but on conventional media at the addressee's end, it is possible to use an inexpensive microprocessor system to control and record the lesson. The system combines the flexibility of computer-supported teaching systems with the versatile presentation possibilities of conventional audiovisual media. Author (ESA)

N81-30810# Federal Compiler Testing Center, Washington, D.C.
IBM CORPORATION IBM SERIES/1 VIRTUAL COBOL COMPILER 5796-NPW VERSION 1.4 Validation Summary Report
30 Mar. 1981 47 p refs
(PB81-182768; CCVS74-VSR745) Avail: NTIS HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the IBM series/1 virtual COBOL compiler version 1.4 (Control Program Support System versopm 1.1), which provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL standard (X3.23-1974/FIPS PUB 21-1), is presented. The VSR is made up of several sections showing the discrepancies found. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed are included. GRA

N81-30811# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
DATABASE ARCHITECTURES: A FEASIBILITY WORKSHOP REPORT Final Report
John L. Berg, ed., Marc Graham, ed., and Kevin Whitney, ed. (Little (Arthur D.), Inc., Cambridge, Mass.) Apr. 1981 70 p refs
(PB81-185159; NBS-SP-500-76; LC-81-600004) Avail: NTIS HC A04/MF A01 CSCL 09B

Two workshops were organized to help the decision maker evaluate the potential benefits and pitfalls in moving forward with data-base technology. The workshops, explored the progress plan and potential pitfalls involved in specifying, designing, and implementing systems based on the ANSI/X3/SPARC framework and the CODASYL JOD languages specification. The general topic of data independence, query languages, data dictionaries, and database conversion are discussed. GRA

N81-30812# University of Southern California, Los Angeles. Office of Interdisciplinary Programs.
TECHNICAL ASSESSMENT OF PERSONAL COMPUTERS: VOLUME 1, SUMMARY
Jack M. Nilles, F. Roy Carlson, Jr., Paul Gray, John P. Hayes, and Milton G. Holmen Sep. 1980 72 p 2 Vol.
(Grant NSF PRA-78-05647)
(PB81-183378; NSF/PRA-7805647/1) Avail: NTIS HC A04/MF A01 CSCL 05C

Technology assessment of personal computers is reported. The findings are presented: an analysis of the current status of personal computer technology, its probable growth during the next decade, the users of personal computers and their choice of applications and some alternatives to personal computers are described; anticipated impacts on society of the widespread use of personal computers and socioeconomic influences on the growth and application of the technology are summarized; specific public policy related implications of personal computer technologies are examined in the areas of education, employment, and technological innovation; the latter especially as it relates to international trade. GRA

N81-30813# University of Southern California, Los Angeles. Office of Interdisciplinary Programs.
TECHNOLOGY ASSESSMENT OF PERSONAL COMPUTERS: VOLUME 2: PERSONAL COMPUTER TECHNOLOGY, USERS, AND USES
Jack M. Nilles, F. Roy Carlson, Jr., Herb Dordick, Paul Gray, and John P. Hayes Sep. 1980 119 p refs 2 Vol.
(Grant NSF PRA-78-183378)
(PB81-183386; NSF/PRA-7805647/2; OIP/PCTA-80-3/2) Avail: NTIS HC A06/MF A01 CSCL 05C

Personal computer and research strategies, were discussed. The report examines: (1) technological developments that will influence the rate of diffusion of personal computer technology among the general public; (2) estimates the probable market for personal computers as a function of time; and (3) describes some possible evolutionary forms of the personal computer and of an alternative mode of development of personal computing. GRA

N81-31099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CURRENT STATUS OF THE HAL/S COMPILER ON THE MODCOMP CLASSIC 7870 COMPUTER
P. J. Lytle *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 232-233 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N81-30814*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOFTWARE CONTROL PROGRAM FOR 25 kW BREADBOARD TESTING
J. A. Pajak 8 Jul. 1981 108 p
(NASA-TM-82430) Avail: NTIS HC A06/MF A01 CSCL 09B

A data acquisition software program developed to operate in conjunction with the automated control system of the 25 kW PM Electric Power System Breadboard Test facility is described. The proram provides limited interactive control of the breadboard test while acquiring data and monitoring parameters, allowing unattended continuous operation. The breadboard test facility has two positions for operating separate configurations. The main variable in each test setup is the high voltage Ni-Cd battery. M.G.

N81-30815*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
USER'S MANUAL FOR FSLIP-3, FLEXSTAB LOADS INTEGRATION PROGRAM
Robert L. Sims Aug. 1981 116 p refs
(NASA-TM-81364; H-1158) Avail: NTIS HC A06/MF A01 CSCL 09B

The FSLIP program documentation and user's manual is presented. As a follow on program to the FLEXSTAB computer analysis system, the primary function of this FORTRAN IV program is to integrate panel pressure coefficients computed by FLEXSTAB to obtain total shear, bending, and torque airloads on various surfaces, summed relative to user specified axes. The program essentially replaces the ALOADS module in FLEXSTAB with expanded capabilities and flexibility. As such, FSLIP is generalized

to work on any FLEXSTAB model or other pressure data if in a compatible format. J.D.H.

N81-30816# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LMP: A MICROPROGRAMMING LANGUAGE [LMP: UMA LINGUAGEM DE MICROPROGRAMACAO]
Wilson Yamaguti Apr. 1981 106 p refs In PORTUGUESE; ENGLISH summary
(INPE-2031-TDL/049) Avail: NTIS HC A06/MF A01

A microprogramming language tailored for use in development of microprogrammed systems is defined. Design goals of this language are to provide the ability to produce efficient microcodes in horizontal microprogramming, and to provide a standard form of microprogram documentation. Some considerations for implementing a translator for this language are presented. J.D.H.

N81-30817# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
GRAPHIC PROJECTION OF A SPACE WITH FOUR-DIMENSIONAL ATTRIBUTES [PROJECAO GRAFICA DE UM ESPACO DE ATRIBUTOS QUADRIMIMENSIONAL]
Honorio Luiz de Carvalho Roch and Mary Minamoto May 1981 47 p refs In PORTUGUESE; ENGLISH summary Presented at Curso Supierior Technologia de Computacao do Ita em 1979 Revised
(INPE-2069-RPE/309-Rev) Avail: NTIS HC A03/MF A01

An image analysis problem is cited where, in a given image of four pectral bands, classes of Gaussian distributions are defined that establish hyper-ellipsoids in a four dimensional space when the maximum likelihood criteria for classification is used. A set of routines which, starting from the parameters that define the hyper-ellipsoids, making it possible to represent their bidimensional projection in a graphic terminal, are described. These projections may be utilized as a training step during the classification process and as an aid for better visualization of the separation of the various classes defined in the image. M.G.

N81-30818# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AUTOGRAF: A SYSTEM FOR AUTOMATIC TREATMENT OF GRAPHICS [AUTOGRAF: UMISTEMA PARA TRATAMENTO AUTOMATICO DE GRAFICOS]
Paulo F. S. Amaral and Jose Antonio G. Pereira Apr. 1981 39 p In PORTUGUESE; ENGLISH summary
(INPE-2041-RPE/295) Avail: NTIS HC A03/MF A01

A computer package to plot graphics is described. The linechart, histogram, piechart, and the barchart are all handled by the system. The graphics are specified in a simple language (almost current Portuguese) and thus no knowledge about the basic plotter routine is required of the user. M.G.

N81-30819# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
METHODS OF COMPRESSION OF HIGH RESOLUTION METEOROLOGICAL SATELLITE IMAGES M.S. Thesis - 15 Aug. 1980 [METODOS DE COMPRESSAO DE IMAGENS DE ALTA RESOLUCAO DE SATELITES METEOROLOGICOS]
Valter Rodrigues Mar. 1981 87 p In PORTUGUESE; ENGLISH summary
(INPE-2017-TDL/048) Avail: NTIS HC A05/MF A01

Some techniques for compression of high resolution meteorological images are analysed. These techniques are linear operations such as averages of (A x B) images elements, and linear and adaptive delta codification. The effects of transmission errors are analysed in some algorithms. The results of simulation techniques are presented in photographs of the codified images. M.G.

N81-30820# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
UTILIZATION OF NONLINEAR PROGRAMMING TECHNIQUES IN PROBLEMS OF COMPLEX SYSTEMS [UTILIZACAO DAS TECNICAS DE PROGRAMACAO NAO-LINEAR EM PROBLEMAS DE GRANDE DIMENSAO]
Jose Carlos dePaula Magalhaes Costa and Welton Carlos Ramos Jan. 1981 263 p refs In PORTUGUESE; ENGLISH summary
(INPE-1977-TDL/036) Avail: NTIS HC A12/MF A01

Optimization methods are applied to complex problems; power systems, economics, and geodesy. Transformation methods and conjugated gradient methods are used to solve the constrained problems in power systems and economics. Conjugated gradient methods are used to solve the unconstrained geodesy problem. Broad applications of the transformation methods are emphasized. In the geodesy problem, the computational efficiency of the Fletcher-Reeves method for optimization of quadratic functions is emphasized. In this problem special storage schemes were used. The method of solution of the economics problem is compared with Beale's method. J.D.H.

N81-30821# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SYSTEM FOR GRAPHIC REPRESENTATION OF INFORMATION M.S. Thesis - 29 Aug. 1980 [UM SISTEMA PARA APRESENTACAO GRAFICA DA INFORMACAO]
Mag Pacheco Dec. 1980 100 p refs In PORTUGUESE; ENGLISH summary
(INPE-1964-TDL/035) Avail: NTIS HC A05/MF A01

The conception, logical and physical project, and implementation of a system for information display in graphic form, specifically, for surface graphic representation is discussed. This system may be used in the reproduction of nautical charts in the standard format, production of maritime perspective relief maps, meteorological isobaric and isothermal charts, maps using remote sensing data, and other similar maps. M.G.

N81-30822# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
INTRODUCTION TO RELATIONAL PROGRAMMING
Bruce J. MacLennan Jun. 1981 33 p refs To be presented at the ACM Conf. on Functional Programming Languages and Computer Architecture, 18-22 Oct. 1981
(RR0000110)
(AD-A101435; NPS52-81-008) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new method of programming, called relational programming, is introduced. This is a style of programming in which entire relations are manipulated rather than individual data. This is analogous to functional programming, wherein entire functions are the value manipulated by the operators. Because of its ability to manipulate complex data structures other than lists, relational programming seems to have distinct advantages over other very high level languages. This paper introduces the basic concepts of relational programming and a preliminary notation for expressing them; it does not define a programming language, per se.
Author (GRA)

N81-30823# California Univ., Berkeley. Operations Research Center.
STABILITY ANALYSIS IN A LEONTIEF OPTIMAL GROWTH MODEL
Chia-Shin Chung Jun. 1981 47 p refs
(Contract N00014-76-C-0134; Grant NSF SES-78-05196)
(AD-A101608; ORC-81-13) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is shown in our model that there are two types of optimal stationary programs: boundary type and interior type. There exists a critical discount factor delta for each type of optimal stationary program such that when the discount factor delta is less than delta primed, the corresponding optimal program will be unstable. Examples are given to demonstrate this. Author (GRA)

N81-30824# California Univ., Berkeley. Operations Research Center.
CHOICE OF TECHNIQUE IN A CONTINUOUS TIME INFINITE HORIZON OPTIMAL GROWTH MODEL
Chsz-Hyen Wu Jun. 1981 56 p refs
(Contract N00014-76-C-0134; Grant NSF SES-78-05196)
(AD-A101610; ORC-81-14) Avail: NTIS HC A04/MF A01 CSCL 12/1

We consider the choice of technique in a continuous time infinite horizon optimal growth model. There are n-2 goods, output, labor and machines M(1),M(2), ..., Mn. We can convert one unit of labor to q units of output or r(i) units of M(i), for each i. Also, we can convert one unit of labor and one unit of M(i) to

q(i) units of output. We prove under some sufficient and necessary conditions that we never build any machines for the general concave utility function. If the condition is not met, we build one machine from beginning to end when the utility function is linear; when the utility function is nonlinear life gets complicated. In the one machine case, we give a general algorithm to solve it. In the many machines case, we prove an asymptotic result (as t approaches infinity, the behavior is similar to that of the linear case) and give examples showing that a simple characterization of the optimal solution is difficult. Author (GRA)

N81-30825# Naval Postgraduate School, Monterey, Calif.
VALUES AND OBJECTS IN PROGRAMMING LANGUAGES
Bruce J. MacLennan Apr. 1981 29 p refs
(AD-A101322; NPS52-81-006) Avail: NTIS HC A03/MF A01 CSCL 09/2

The terms value-oriented and object-oriented are used to describe both programming languages and programming styles. This paper will describe the differences between values and objects and to show that their proper discrimination can be a valuable aid to conquering program complexity. The first section will show that values amount to timeless abstractions for which the concepts of updating, sharing and instantiation have no meaning. The second section will show that objects exist in time and, hence, can be created, destroyed, copied, shared and updated. The third section shows that proper discrimination of these concepts in programming languages will clarify problems such as the role of state in functional programming. The paper concludes by demonstrating the use of the value/object distinction as a tool for program organization. Author (GRA)

N81-30826# Sandia Labs., Albuquerque, N. Mex.
DEVELOPMENT AND TESTING OF FIDELE: A COMPUTER CODE FOR FINITE-DIFFERENCE SOLUTION TO HARMONIC MAGNETIC-DIPOLE EXCITATION OF AN AZIMUTHALLY SYMMETRIC HORIZONTALLY AND RADIALLY LAYERED EARTH
Charles N. Vittitoe Apr. 1981 59 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0196) Avail: NTIS HC A04/MF A01

The FORTRAN IV computer code FIDELE simulates the high frequency electrical logging of a well in which induction and receiving coils are mounted in an instrument sonde immersed in a drilling fluid. The fluid invades layers of surrounding rock in an azimuthally symmetric pattern, superimposing radial layering upon the horizontally layered Earth. Maxwell's equations are reduced to a second order elliptic differential equation for the azimuthal electric field intensity. The equation is solved at each spatial position where the complex dielectric constant, magnetic permeability, and electrical conductivity have been assigned. Receiver response is given as the complex open circuit volage on receiver coils. The logging operation is simulated by a succession of such solutions as the sonde traverses the borehole. Test problems verify consistency with available results for simple geometries. The code's main advantage is its treatment of a two dimensional Earth; its chief disadvantage is the larger computer time required for typical problems. DOE

N81-30827# Oak Ridge National Lab., Tenn.
TPASS: A GAMMA-RAY SPECTRUM ANALYSIS AND ISOTOPE IDENTIFICATION COMPUTER CODE
J. K. Dickens Mar. 1981 93 p refs
(Contract W-7405-eng-26)
(ORNL-5732) Avail: NTIS HC A05/MF A01

The gamma ray spectral data reduction and analysis computer code TPASS is described. This computer code is used to analyze complex Ge(Li) gamma ray spectra to obtain peak areas corrected for detector efficiencies, from which are determined gamma ray yields. These yields are compared with an isotope gamma ray data file to determine the contributions to the observed spectrum from decay of specific radionuclides. A complete FORTRAN listing of the code and a complex test case are given. DOE

N81-30828# Oak Ridge National Lab., Tenn. Computer Sciences Div.
COMPUTER GRAPHICS AT OAK RIDGE NATIONAL LABORATORY: SOME OBSERVATIONS BASED ON EXPERIENCE
Paul E. Johnson 1981 19 p refs Presented at the Conf. on Computer Graphics Appl., Princeton, N.J., 2 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810440-1) Avail: NTIS HC A02/MF A01

A philosophy for development of computer graphics software, particularly computer mapping, is presented. It is concluded that computer mapping software should not be developed apart from the researcher or analyst, and that those efforts developed apart tend to be esoteric in nature. Three examples involving regional energy modeling and related impact assessment are used to illustrate the integration of computer graphics development into research involving geographical analysis. DOE

N81-30829# California Univ., Livermore. Lawrence Livermore Lab. Weapons Engineering Div.
TRIX-80 EDITING SYSTEM: A PRODUCTION AID FOR ENGINEERING DRAWINGS
Charles D. Hoover, III 8 May 1981 40 p
(Contract W-7405-eng-48)
(UCID-19032) Avail: NTIS HC A03/MF A01

A text-editing system called TRIX-80, which may be used for the production of text for engineering drawings or for other text applications is described. The text-editing system provides enhanced reproduction quality for drawing text and provides increased productivity through rapid text entry and correction. All available editing commands are documented and examples for the technical and engineering user are included. DOE

N81-30830# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electronics Engineering.
COST JUSTIFICATION FOR AN INTERACTIVE COMPUTER-AIDED DESIGN DRAFTING/MANUFACTURING SYSTEM
F. J. Norton 23 Sep. 1980 23 p refs Presented at 6th Ann. ADUA Meeting, Denver, 30 Sep. - 3 Oct. 1980 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-84966) Avail: NTIS HC A02/MF A01

Capital, expense, and benefits as related to interactive computer aided design drafting/manufacturing systems are discussed and model calculations are included. An example is treated by the simple payback method and the more sophisticated methods of net present value (NPV) and internal rate of return (IRR). The NPV and IRR approaches include in the calculation the time value of money and provide a sounder foundation on which to base the purchase decision. It is hoped that an understanding of these techniques by technical personnel will make an optimum system purchase more likely. DOE

N81-30831# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electronics Engineering.
SELECTING AND IMPLEMENTING AN INTERACTIVE COMPUTER AIDED DESIGN DRAFTING/MANUFACTURING (CADD/M) SYSTEM
Frederick J. Norton 23 Sep. 1980 54 p ref Presented at the 6th Ann. ADUA Meeting, Denver, 30 Sep. - 3 Oct. 1980
(Contract W-7405-eng-48)
(UCRL-84965; CONF-8009151-3) Avail: NTIS HC A04/MF A01

Procedures for selecting and successfully implementing a CADD/M system are outlined. The techniques used to evaluate the system are examined. The methods that can be used to test a CADD/M system are described including benchmark drawings and specifications, human engineering considerations, and other evaluation criteria. DOE

N81-30832# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electronics Engineering.
COMPUTER-AIDED DESIGN DRAFTING/MANUFACTURING (CADD/M) FACILITY PREPARATION
Frederick J. Norton 23 Sep. 1980 16 p Presented at the 6th Ann. ADUA Meeting, Denver, 30 Sep. 3 Oct. 1980
(Contract W-7405-eng-48)
(UCRL-84964; CONF-8009151-4) Avail: NTIS HC A02/MF A01

Such things as temperature requirements, lighting, power, security and fire protection are discussed. Also, future expansion

needs are considered so that major construction will not be required for future years. Advanced planning in these areas is needed to ensure successful implementation of a CADD/M system. This leads to considerable cost savings, and in the long run, improves the scheduling for an entire project, from initial design to final production. This careful preparation minimizes unplanned events and problem areas. R.C.T.

N81-30833# California Univ., Livermore. Lawrence Livermore Lab.

DOE WORKSHOP ON DESIGN AUTOMATION AND COMPUTER-AIDED DESIGN: ABSTRACTS

1980 44 p Abstracts of papers presented at the Workshop on Design Automation and Computer Aided Design, Livermore, Calif., 10-11 Jun. 1980

(Contract W-7405-eng-48)

(UCID-18649; CONF-8006166) Avail: NTIS HC A03/MF A01

Needs, activities, and plans for design automation (DA) and computer aided design (CAD) of engineering systems within the DOE laboratories and major DOE contractors are described. Abstracts of 30 papers are presented. DOE

N81-30834# California Univ., Berkeley. Lawrence Berkeley Lab.

RELATIVE PERFORMANCES OF SEVERAL SCIENTIFIC COMPUTERS FOR A LIQUID MOLECULAR DYNAMICS SIMULATION

D. M. Ceperley Aug. 1980 11 p refs Presented at the 180th Am. Chem. Soc. Meeting, 2nd Chem. Congr. of the North Am. Continent, Las Vegas, Nev., 24-29 Aug. 1980

(Contract W-7405-eng-48; Grant NSF CHE-77-21305)

(LBL-12054; CONF-800814-33) Avail: NTIS HC A02/MF A01

Some of the computational characteristics of simulations and experience in using the standard simulation program called CLAMPS on several scientific computers are discussed. The CLAMPS is capable of performing metropolis Monte Carlo and molecular dynamics simulations of arbitrary mixtures of single atoms. The computational characteristics of simulations and what makes a good simulation computer are also summarized. DOE

N81-30835# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science

FLOYD'S PRINCIPLE, CORRECTNESS THEORIES AND PROGRAM EQUIVALENCE

J. A. Bergstra (Leiden Univ.), J. Tiuryn (Warsaw Univ.), and J. V. Tucker Sep. 1980 54 p refs Submitted for publication

(MC-IW-145/80) Avail: NTIS HC A04/MF A01

The sets of all 'before-after' first order assertions which are true of programs in any programming system are shown to uniquely determine the input-output semantics of the system providing one allows the use of auxiliary operators on its ground types. Programming systems are studied where the data types are syntactically defined using a first order specification language with the objective of eliminating these auxiliary operators. Input-output correctness theories fail to determine program equivalence for a very simple programming system with an algebraic specification. Complete first order specifications and arithmetical computation in the context of a specified programming system are also analyzed. Author (ESA)

N81-30836# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

DESIGNING A MACHINE INDEPENDENT STORAGE MANAGEMENT SYSTEM

H. B. M. Jonkers Oct. 1980 70 p refs Submitted for publication

(MC-IW-148/80) Avail: NTIS HC A04/MF A01

A systematic method of designing a storage management system for a machine independent language implementation is described. It is based on constructing an abstract model, which contains exactly the information relevant to storage management and no more than that. The model allows the problem to be approached in a rigorous and transparent way, up to a level of formality where proofs of correctness are possible. The effectiveness of the method is demonstrated in the design of a storage management system for a machine independent ALGOL 68 implementation. Author (ESA)

N81-30837# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

OPERATIONAL AND DENOTATIONAL SEMANTICS DESCRIBING THE MATCHING PROCESS IN SNOBOL4

A. Debruin Oct. 1980 38 p refs Submitted for publication

(MC-IW-151/80) Avail: NTIS HC A03/MF A01

The pattern matching process in SNOBOL4 is investigated. A subset of the language which is simple in that patterns are not allowed as values of variables is considered. This leads to matching processes that always terminate. An informal description of the matching algorithm and an operational semantics in the SECD-machine style are presented. This semantics uses a stack to implement backtracking which can occur during matching. A denotational semantics is introduced which uses continuations to describe the backtracking. Equivalence of the two semantics is then proved. The operational and denotational semantics are as similar as possible while retaining the typical operational, respectively denotational ideas. This leads to a straightforward equivalence proof. That this similarity pays off is shown by another, somewhat disparate operational semantics for which equivalence with the denotational semantics is much harder to prove. Author (ESA)

N81-30838# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

ON THE OPERATIONAL STRUCTURE OF ALGEBRAIC PROGRAMMING SYSTEMS

P. R. J. Asveld and J. V. Tucker Oct. 1980 40 p refs Submitted for publication

(MC-IW-152/80) Avail: NTIS HC A03/MF A01

The semantics problems involved in assessing computational complexity in the context of small scale programming systems whose data types were designed using algebraic specification methods are considered. The programming systems which are considered possess a selection of deterministic and non deterministic control and assignment constructs, and data types which are characterized in a formal specification naming a set of primitive operators on different kinds of data, which satisfy a given set of axioms. An operational view of the semantics of such a system is developed for the purpose of analyzing the complexities intrinsic to the computation they support and, especially, in order to make a useful classification of programming systems based upon the space and time resources involved in their implementation. Some theorems are proved, and a precise mathematical view of algebraic semantics of high level computation is given. Author (ESA)

N81-30839# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

ON THE NOTION OF CORRECT REFINEMENT OF PROGRAMS

R. J. R. Back Dec. 1980 33 p refs Submitted for publication

(MC-IW-153/80) Avail: NTIS HC A03/MF A01

The stepwise refinement technique is studied from a mathematical point of view. A relation of correct refinement between programs is defined, based on the principle that refinement steps should be correctness preserving. Refinement between programs will therefore depend on the criterion of program correctness used. The application of the refinement relation in showing the soundness of different techniques for refining programs is discussed. Special attention is given to the use of abstraction in program construction. Refinement with respect to partial and total correctness is studied in more detail, both for deterministic and nondeterministic programs. The relationship between these refinement relations and the approximation relation of fixpoint semantics is studied, as well as the connection with the predicate transformers used in program verification. Author (ESA)

N81-30840# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

CORRECTNESS OF EXPLICITLY SPECIFIED PROCEDURES

R. J. R. Back Dec. 1980 39 p refs Submitted for publication

(MC-IW-154/80) Avail: NTIS HC A03/MF A01

Explicit specification of a procedure by a program statement describing the effect of executing the procedure is contrasted with the usual way in which a procedure is specified in program verification by giving its pre- and postconditions. The explicit technique is found to give simpler and more readable specifications. A proof system for the correctness of explicitly specified procedures is described. The notion of correctness used is partial correctness together with absence of run time errors. The proof rules cover both recursive procedures and procedures with parameters. Special attention is given to the modular structure of programs with procedures. An extension of the technique, making explicit specifications as powerful as pre- and postconditions is also presented. Author (ESA)

N81-30841# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

ON THE REFINEMENT OF SPECIFICATIONS AND HOARE'S LOGIC

J. A. Bergstra (Leiden Univ.) and J. V. Tucker Dec. 1980 23 p refs Submitted for publication

(MC-IW-155/80) Avail: NTIS HC A02/MF A01

The basic proof of the theory of Hoare's logic for the partial correctness of while-programs whose underlying data types are defined by first-order axiomatic specifications is developed. The effects of refining data type specifications on the program correctness proofs they support are studied. It is shown that any finite selection of refinements is stable relative to a given asserted program, but that this stability is a strictly local property of families of specifications. Author (ESA)

N81-30842# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

THE COMPLETENESS OF THE ALGEBRAIC SPECIFICATION METHODS FOR DATA TYPES

J. A. Bergstra (Leiden Univ.) and J. V. Tucker Dec. 1980 21 p refs Submitted for publication

(MC-IW-156/80) Avail: NTIS HC A02/MF A01

A fundamental theorem about the adequacy of the algebraic specification methods for data abstractions is proved. Let A be a data type with n subtypes. Then A is computable if and only if A possesses an equational specification, involving at most $3(n+1)$ hidden operators and $2(n+1)$ axioms, which defines it under initial and final algebra semantics simultaneously.

Author (ESA)

N81-30843# Sheffield Univ. (England). Dept. of Control Engineering.

ON REAL-TIME SYSTEM DESIGN

S. Bennett Oct. 1980 12 p refs

(RR-128) Avail: NTIS HC A02/MF A01

An indication of the general structure required for a real time program is presented, making use of the ideas of structural programming and synchronization of multiprograms. The support processes can be designed as a multiprogram system; the control processes can be designed as a sequential program, and the real time processes are the External Process Handler and the Control Message Handler (also known as interrupt handler and monitor). In this way, consideration of the more difficult real time synchronization is restricted to a small part of the design. The real time system must be fault tolerant and the designer must attempt to build into the system as much protection against degradation by faults as possible. Author (ESA)

N81-30844# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

PGEN: A GENERAL PURPOSE PARSER GENERATOR

G. Florijn (Hogere Informatica Opleiding) and G. Rolf (Hogere Informatica Opleiding) Jan. 1981 49 p refs

(MC-IW-157/81) Avail: NTIS HC A03/MF A01

The use and implementation of a parser generator that generates recursive descent parsers with automatic error recovery is described. The input for PGEN is a LL(1) grammar written in a powerful, Backus-Naur form-like metalanguage. This grammar can be augmented with user defined actions for building parse trees, generating code, etc. The generator checks the correctness of the grammar and generates a recursive descent parser which contains suitable error recovery operations and error messages. The resulting parser is a SUMMER program. The user should be familiar with SUMMER, since the actions that can be associated with parts of a grammar must be written in this language. A user manual and an implementation manual are included.

Author (ESA)

N81-30845# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

FORMAL LANGUAGE DEFINITIONS CAN BE MADE PRACTICAL

Paul Klint Feb. 1981 19 p refs Submitted for publication

(MC-IW-159/81) Avail: NTIS HC A02/MF A01

The various uses of formal definitions are summarized and a method for operational language definitions is presented. This method aims at language descriptions that are understandable and useful for designer, implementor and user of a defined language. The defined language is SUMMER, an object oriented string processing language. The operational language definition method uses recursive functions and syntactic recognition functions to define a finite state machine that associates semantic actions with all constructs in the grammar of the language. Readability is enhanced by using imperative constructs and a concise notation for parsing and decomposing the source text of programs. The language SUMMER, extended with such parsing and decomposing operations, is used as the defining language. Various examples of the definition are given and the method as a whole is assessed. Author (ESA)

N81-30846# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

ON THE EXISTENCE OF COOK SEMANTICS

A. deBruin Apr. 1981 38 p refs Submitted for publication

(MC-IW-163/81) Avail: NTIS HC A03/MF A01

A method of defining operational semantics of programming languages was investigated based upon soundness and completeness of Hoare systems. For a simple language, the most sophisticated feature of which is that it has parameterless procedures, it is shown that the equations which characterize the compute function have a unique solution. It is demonstrated first in a straightforward way, and then by defining the solution through an iterative process using fixed point techniques or some topology. The presented techniques can also be applied to other languages described in the same way. Author (ESA)

N81-30847# Research Inst. of National Defence, Stockholm (Sweden).

ON IMAGE RESTORATION AND NOISE REDUCTION WITH RESPECT TO SUBJECTIVE CRITERIA

Sten Nyberg 1981 39 p refs

(FOA-Vol-15-No-1; FOA-B-30045-E1; ISBN-91-7056-055-2) Avail: NTIS HC A03/MF A01

The problem of applying subjective image quality criteria when designing image enhancement methods was studied. Image quality measures and the use of perceptual factors in image restoration is reviewed. A variation of the Wienerfilter is proposed called the fixed signal to noise ratio filter. One property of this filter is that the output signal to noise ratio is constant. An iterative method of restoration, the projection method, is investigated. Using measurements of blur and noise in the image after each iteration, it is possible to decide when to stop iterating. Combining adaptive noise reduction methods with the projection method makes an efficient procedure for image enhancement, where it is easy to incorporate information on visual perception. Author (ESA)

N81-31093*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ON COUNTERS USED FOR NODE SYNCHRONIZATION

C. A. Greenhall *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 173-179 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N81-30848# Massachusetts Inst. of Tech., Cambridge. Lab of Information and Decision Systems.

AN OPTIMAL CONTROL APPROACH TO DYNAMIC ROUTING IN NETWORKS. PART 2: A MAXIMAL FLOW APPROACH

Mario Jodorkovsky (Technion, Haifa, Israel) and Adrian Segall (Technion, Haifa, Israel) Jun. 1981 27 p refs Submitted for publication

(Contract N00014-75-C-1183; NR Proj. 049-383)

(AD-A101609; LIDS-P-1100) Avail: NTIS HC A03/MF A01 CSCL 17/2

This paper presents a new approach for building the feedback solution for the minimum delay dynamic message routing problem for single destination networks. The necessary and sufficient conditions for optimality derived in previous works are interpreted in terms of weighted maximal flow problems. Several properties concerning these problems are obtained and used to develop a simplified algorithm for building the feedback space. The various steps of the algorithm are presented and motivated in detail.

Author (GRA)

N81-30849# Sandia Labs., Albuquerque, N. Mex.

SNLA TERMINAL SWITCHING NETWORK

Michael O. Vahle, Lawrence F. Tolendino, and Mark D. Thompson 1981 6 p refs Presented at the 24th Midwest Symp. on Circuits and Systems, Albuquerque, N. Mex., 29 Jun. 1981

(Contract DE-AC04-76DP-00789)

(SAND-81-0691C; CONF-810623-2) Avail: NTIS HC A02/MF A01

The rapidly growing number of interactive terminals at Sandia National Laboratories must compete for a limited number of computer ports. In addition, interactive computer users require access to several host systems. In order to meet these needs a terminal switching network was designed which utilizes circuit switching techniques to provide port contention and multiple host access.

DOE

N81-30850# Sandia Labs., Albuquerque, N. Mex. Scientific Network Design Div.

OVERVIEW OF THE SANDIA CENTRAL COMPUTING NETWORK

William J. Hunteman May 1981 22 p

(Contract DE-AC04-76DP-00789)

(SAND-81-0977) Avail: NTIS HC A02/MF A01

An overview of the Central Computing Network (CCN) is presented. The network-related functions provided by each CCN node are described.

DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N81-30851*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A METHOD FOR OBTAINING REDUCED-ORDER CONTROL LAWS FOR HIGH-ORDER SYSTEMS USING OPTIMIZATION TECHNIQUES

Vivek Mukhopadhyay, Jerry R. Newsom, and Irving Abel Aug. 1981 66 p refs

(NASA-TP-1876; L-14355) Avail: NTIS HC A04/MF A01 CSCL 12A

A method of synthesizing reduced-order optimal feedback control laws for a high-order system is developed. A nonlinear programming algorithm is employed to search for the control law design variables that minimize a performance index defined by a weighted sum of mean-square steady-state responses and control inputs. An analogy with the linear quadractic Gaussian solution is utilized to select a set of design variables and their initial values. To improve the stability margins of the system, an input-noise adjustment procedure is used in the design algorithm. The method is applied to the synthesis of an active flutter-suppression control law for a wind tunnel model of an aeroelastic wing. The reduced-order controller is compared with the corresponding full-order controller and found to provide nearly optimal performance. The performance of the present method appeared to be superior to that of two other control law order-reduction methods. It is concluded that by using the present algorithm, nearly optimal low-order control laws with good stability margins can be synthesized.

M.G.

N81-30852# L N K Corp., Inc., Silver Spring, Md.

KNOWLEDGE-BASED IMAGE ANALYSIS Progress Report, 1 Sep. 1978 - 1 Dec. 1980

George C. Stockman, Barbara A. Lambird, David Lavine, and Laveen N. Kanal Apr. 1981 243 p refs

(Contract DAAK70-77-C-0110)

(AD-A101319; ETL-0258) Avail: NTIS HC A11/MF A01 CSCL 09/2

The work reported was directed toward employing a priori knowledge in the automatic analysis of aerial imagery. Major objectives of the research were directed toward (1) map-guided registration; (2) verification of geographic data bases extracted from imagery; (3) enrichment of geographic data bases; and (4) automatic terrain feature extraction using multiple sources of knowledge and multi-level decision making. The key component in all of the work was the matching of existing iconic structure in a geographic data base (GDB) with detected image structure. By using iconic knowledge, the image interpretation paradigm becomes a three step process. First, some primitive features of the imagery must be recognized without any area-specific knowledge. Second, the imagery is aligned or registered with the knowledge base by drawing correspondences between the image features and their iconic analogues in the GDB. The matching is formalized by derivation of a transformation which maps points (x,y) of the image to points (u,v) in GDB coordinates. The final step of the process is the analysis of those parts of the image which were not successfully interpreted in steps 1 and 2. This implies a top-down search for image structures which correspond to features in the GDB. Section 2 of the report treats primitive extraction. The emphasis is currently on lineal, point, and region features only. A method for automatically inferring a rotation and translation transforming image to map is given in Section 3. Classification of registered regions is discussed in Section 4. Verification of lineal GDB features in gray-scale imagery is introduced in Section 5.

Author (GRA)

N81-30853# Sheffield Univ. (England). Dept. of Control Engineering.

ROBUST CONTROL OF UNKNOWN DISCRETE MULTIVARIATE SYSTEMS

D. H. Owens and A. Chotai Jan. 1981 10 p refs

(RR-135) Avail: NTIS HC A02/MF A01

The robustness of a technique for developing discrete, first-order models for multivariable process control is discussed, and its applications extended to provide computable measures to permissable data inaccuracies. The use of fast sampling rates is shown to be an important tool in producing a robust design, allowing the tolerable errors in estimating parameter matrices to be quantifiably large.

Author (ESA)

N81-30854# Sheffield Univ. (England). Dept. of Control Engineering.

SUFFICIENT CONDITIONS FOR NONCONTROLLABILITY OF HOMOGENOUS BILINEAR SYSTEMS

D. H. Owens Jan. 1981 8 p refs

(RR-137) Avail: NTIS HC A02/MF A01

Conditions for a homogeneous (in the state) input bilinear system not to be controllable are derived in terms of the properties of the impulse response matrix. They have the advantage of being expressed in terms of a quantity (the impulse response) familiar to practicing control engineers. The result can frequently be checked simply by inspection of the transfer function poles and zeros.

Author (ESA)

N81-30855# Sheffield Univ. (England). Dept. of Control Engineering.

ROBUST STABILITY OF MULTIVARIABLE FEEDBACK SYSTEMS WITH RESPECT TO LINEAR AND NONLINEAR FEEDBACK PERTURBATIONS

D. H. Owens and A. Chotai Jan. 1981 14 p refs

(RR-141) Avail: NTIS HC A02/MF A01

Abstract quantitative measures of the robustness of multivari-

able feedback systems with respect to feedback perturbations are presented. The approach provides a means of considering a class of unstable plant perturbations and gives some indication of the effect of the choice of controller structure on robustness. Author (ESA)

N81-30856# Sheffield Univ. (England). Dept. of Control Engineering.
ON THE STABILITY OF NONLINEARITY INTERCONNECTED LARGE SCALE SYSTEMS
S. P. Banks 1980 19 p refs
(RR-142) Avail: NTIS HC A02/MF A01

Graph theoretic techniques for formulating input-output stability using decompositions are used for the case of nonlinearly interconnected systems. An interconnection hypergraph is defined and decomposition theory is used to represent the hypergraph as a tree of strongly connected components. A minimal essential set is then found for each strongly connected component and a nonlinear system is derived which depends only on the outputs of the combining points corresponding to the vertices included in this minimal essential set. Author (ESA)

N81-30857# Sheffield Univ. (England). Dept. of Control Engineering.
A NOTE ON NONLINEAR OBSERVERS
S. P. Banks Sep. 1980 10 p refs
(RR-126) Avail: NTIS HC A02/MF A01

The nonlinear variation of constants formula is used to derive exponential observers for nonlinear perturbations of nonlinear systems. Use is made of a matrix function which can become strictly negative by an appropriate combination of the observations. It is shown that the basic system must be fairly restricted. It is necessary for the unperturbed system to be stabilizable by a suitable combination of the observations, and that the nonlinear perturbation has uniformly bounded slope or is Lipschitz. Author (ESA)

N81-30858# Sheffield Univ. (England). Dept. of Control Engineering.
IDENTIFICATION OF SYSTEMS COMPOSED OF LINEAR DYNAMIC AND STATIC NONLINEAR ELEMENTS
S. A. Billings and S. Y. Fakhouri (Bradford Univ., England) Nov. 1980 41 p refs
(RR-131) Copyright. Avail: NTIS HC A03/MF A01

Identification of nonlinear systems which can be represented by combinations of linear dynamic and static nonlinear elements are considered. Results based on correlation analysis are combined to provide a unified treatment for this class of systems. Systems composed of cascade, feedforward, feedback and multiplicative connections of linear dynamic and zero memory nonlinear elements can be identified in terms of the individual component subsystems from measurements of the system input and output only. Author (ESA)

N81-30859 Sheffield Univ. (England). Control Theory Centre.
NUMERICAL OPTIMISATION OF MULTIPASS PROCESSES
R. P. Jones and D. H. Owens (Sheffield Univ., England) Dec. 1980 8 p refs
(RR-133) Copyright. Avail: NTIS HC A02/MF A01

The linear quadratic problem for differential multipass processes is considered. Linear differential multipass processes are modelled by state equations where the coefficients are matrices. The quadratic optimization problem for such systems is solved by the means of an iterative technique for computing the optimal state and control trajectories. The computed control is semi-closed loop in nature and the algorithm is based on the solution of linearly constrained minimum norm problems in Hilbert space. The method is illustrated with an application to a linear differential multipass process model of a self steered tractor, and it is demonstrated that convergence to the optimal solution can be obtained in a small number of iterations. Author (ESA)

N81-30860# Sheffield Univ. (England). Dept. of Control Engineering.
SIMPLE MODELS FOR ROBUST CONTROL OF UNKNOWN OR BADLY-DEFINED MULTIVARIABLE SYSTEMS
D. H. Owens and A. Chotai Dec. 1980 36 p refs
(RR-136) Avail: NTIS HC A03/MF A01

A class of unknown multivariable process plants is identified such that robust proportional plus integral control systems can be designed without encountering difficulties which are characteristic of self tuning controllers. Attention is focused primarily on the case of discrete sampled data systems with synchronous input and output sampling. Controller design is shown to be possible on the basis of a plant model that is a multivariable generalization of the classical notion of a first order lag deduced from open loop plant step response data. Fast response speeds, zero steady state errors and small loop interaction effects are obtained. Transient effects are also discussed. Numerical examples are given. Author (ESA)

N81-30861# Sheffield Univ. (England). Dept. of Control Engineering.
RANDOM PROCESSES IN NONLINEAR SYSTEMS
S. A. Billings Feb. 1981 18 p refs Presented at SRC Vacation School on Stochastic Processes in Control Systems, Warwick, England, 29 Mar. - 3 Apr. 1981
(RR-143) Copyright. Avail: NTIS HC A02/MF A01

A review of the methods which are available for the statistical analysis of static and dynamic nonlinear systems, linearization methods and identification algorithms is presented. The autocorrelation function of the output in static systems is given as a power series of the normalized autocorrelation function of the input where the coefficients depend on the form of nonlinearity. A general result for the input-output cross correlation function can be obtained by introducing separable processes. Volterra series representation of dynamic nonlinear systems are analyzed. Stochastic vector differential equations are discussed which are characterized by the first order probability density function and the transitional probability density function, both of which are shown to satisfy the Fokker-Plank-Kolmogorov equation. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N81-30862 New York Univ., N. Y.
NUMERICAL SOLUTION OF HYDRODYNAMIC FREE BOUNDARY PROBLEMS Ph.D. Thesis
Michael John Miksis 1981 145 p
Avail Univ. Microfilms Order No. 8115563

The solutions of six different free boundary problems are presentd. Five deal with the shape of a gas bubble or liquid drop. The sixth concerns the collapse of an infinite wedge of water. The first four are equilibrium free boundary problems for a harmonic potential. The potential is defined either interior to or exterior to a boundary on which it satisfies a nonlinear boundary condition. Each problem is formulated as a nonlinear integro-differential system of equations for the free boundary and the potential function on it. The system is discretized and then solved by Newton's method. When possible, analytical solutions for limiting values of the parameters is obtained. Dissert. Abstr.

N81-30863 Rice Univ., Houston, Tex.
A PENALTY-GALERKIN METHOD FOR SOLVING THE MISCIBLE DISPLACEMENT PROBLEM Ph.D. Thesis
Bruce Leslie Darlow 1981 155 p
Avail: Univ. Microfilms Order No. 8116951

The implementation of an interior penalty Galerkin procedure is described for the simulation of the areal miscible displacement of one incompressible fluid by another in a horizontal porous medium. The method permits different time steps and discretizations for pressure and concentration, logarithmic leading parts for the pressure in the neighborhoods of wells, and a radial approximation for concentration at early time. An algorithm for simulating self-adaptive mesh refinement utilizing the penalty functions is defined. Numerous experiments are presented. Dissert. Abstr.

N81-30864# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

OPTIMAL LINEAR ESTIMATION AND SUBOPTIMAL NUMERICAL SOLUTIONS OF DYNAMICAL SYSTEMS CONTROL PROBLEMS

Atair Rios Neto and Luiz Antonio Waack Bambace May 1981 6 p refs Presented at the Intern. Symp. on Spacecraft Flight Dyn., Darmstadt, West Germany, 17-23 May 1981
(INPE-2077/RPE/312) Avail: NTIS HC A02/MF A01

A procedure for the generation of open loop suboptimal numerical solutions in the dynamical systems optimal control problem is proposed. The approximation of the control by a function dependent upon a finite number of parameters, and the use of a linear perturbation scheme associated with a direct search criterion reduce the problem to one of parameter optimization in each iteration. A stochastic approach to establish the search criterion and to treat the errors due to the first order approximation makes it possible to arrive at the search increment using optimal linear estimation. M.G.

N81-30865# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

A RATIONAL FUNCTION APPROXIMATION FOR THE INTEGRATION POINT IN EXPONENTIALLY WEIGHTED FINITE ELEMENT METHODS

Joseph E. Flaherty Jun. 1981 25 p refs Submitted for publication
(Grant AF-AFOSR-0192-80; DA Proj. 1L1-61102-BH-57)
(AD-A101268; AFOSR-81-0447TR; ARLCB-TR-81022) Avail: NTIS HC A02/MF A01 CSCL 12/1

A rational function is presented for approximating the function $f(z) = \coth z - 1/z$ that appears in several exponentially fitted or weighted finite difference and finite element methods for convection-diffusion problems. The approximation is less expensive to evaluate than f(z) and provides greater accuracy than the doubly asymptotic approximation when $z = O(1)$. Author (GRA)

N81-30866# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Department.

AN AID IN STEEPEST DESCENT EVALUATION OF INTEGRALS

Albert H. Nuttall 27 Feb. 1981 41 p refs
(ZR0000101)
(AD-A101474; NUSC-TR-6433) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple technique for determining the steepest descent contours of integrands is explained and programmed in BASIC, and then applied to a variety of examples, some of which are very difficult to ascertain analytically, including one with an infinite number of saddle points. The amount of programming is minimal, requiring numerical evaluation only of the derivative of an analytic function. Author (GRA)

N81-30867# Ballistic Research Labs., Aberdeen Proving Ground, Md.

PARTITIONABILITY OF IMPLICIT LEAST SQUARES MODEL FITTING PROBLEMS

Aivars Celmins May 1981 35 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A101356; AD-E430641; ARBRL-TR-02317) Avail: NTIS HC A03/MF A01 CSCL 12/1

Non-linear least squares model fitting problems differ from general optimization problems due to the special structure of the least squares normal equations. In simple least squares problems, that structure algorithmic simplification can be achieved. More general least squares problems can often be made partitionable by proper parameter manipulations. In this report, sufficient partitionability conditions are derived and parameter manipulations are discussed for the achievement of partitionability. GRA

N81-30868# Maryland Univ., College Park. Dept. of Physics and Astronomy.

NETWORK COMMUNICATIONS FOR A NATIONAL COMPUTATIONAL FACILITY: A REPORT TO THE NSF SUBCOMMITTEE

William M. MacDonald 1981 12 p
(Contract DE-AS05-76ER-05126)
(DOE/ER-05126/T1; ORO-5126-129; PP-81-172) Avail: NTIS HC A02/MF A01

The use of an existing public network to provide access to a national computational facility from terminals at numerous sites throughout the country and to permit computer to computer operations is considered. At present, two public networks are available, Telenet and Tymnet. Telenet offers significant advantages over Tymnet, and the facilities, it's offers are the basis of the dicussion. A cost estimate for a national computational facility is presented. DOE

N81-30869# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

METHODOLOGIES FOR CALCULATING MEASUREMENT UNCERTAINTIES

G. D. Lassahn 1981 5 p refs Presented at 27th Intern. Instrumentation Symp., Indianapolis, 27 Apr. 1981
(Contract DE-AC07-76ID-01570)
(CONF-810406-7) Avail: NTIS HC A02/MF A01

A general procedure for estimating and reporting measurement uncertainty is outlined and is compared with other procedures. The primary advantage of the procedure is that the uncertainty is defined concisely, consistently, and objectively. Concepts are defined and analyzed statistically. DOE

N81-30870# Harvard Univ., Cambridge, Mass. Museum of Comparative Zoology.

STUDY OF MATHEMATICAL MODELS OF MUTATION AND SELECTION IN MULTI-LOCUS SYSTEMS Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981

R. C. Lewontin 1981 12 p
(Contract DE-AS02-76EV-02472)
(DOE/EV-02472/T1; COO-2472-07) Avail: NTIS HC A02/MF A01

Numerical studies were made of 2 locus selection models with asymmetric fitness. These were created by perturbing the fitness matrices of symmetric models whose results are known analytically. A complete classification of solved models was made and all perturbations of these were undertaken. The result is that all models lead to three classes of equilibrium structure. In some cases there is gene fixation at intermediate linkage. It is shown that selection may favor more recombination, contrary to the usual expectation, if multiple locus polymorphisms are maintained by a mechanism other than marginal overdominance. This may be the result of mutation selection balance or frequency dependent selection. In a haplo-diploid system in which diploid males are lethal (as in bees and braconid wasps) the number of sex alleles that can be maintained depends both on breeding size and the number of colonies. Thirty five to fifty colonies are sufficient to maintain very large numbers of sex alleles. DOE

N81-30871# Colorado Univ., Boulder. Dept. of Chemical Engineering.

SOLUTION OF THE TIME-DEPENDENT INCOMPRESSIBLE NAVIER-STOKES EQUATIONS VIA A PENALTY GALERKIN FINITE ELEMENT METHOD

Robert L. Sani, Brian E. Eaton, Philip M. Gresho, Robert L. Lee, and Stevens T. Chan Jan. 1981 12 p refs Presented at the Intern. Conf. on Numerical Methods for Laminar and Turbulent Flow, Venice, 13 Jul. 1981 Prepared jointly with California Univ., Livermore. Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(UCRL-85354; CONF-810702-1) Avail: NTIS HC A02/MF A01

The existence of an initial nonphysical transient when using the penalty method in modeling the time dependence incompressible Navier-Stokes equations is investigated theoretically and demonstrated numerically using the Galerkin finite element technique. A stable, variable step time integration scheme which can overlook the initial nonphysical transient while using reasonable sized time steps is described. Numerical examples illustrating the time integration scheme and concomitantly the difference in transient response of an incompressible fluid and its slightly compressible (penalty) analog are presented. DOE

N81-30872# California Univ., Livermore. Lawrence Livermore Lab.

SOLUTION OF THE TIME-DEPENDENT, THREE-DIMENSIONAL INCOMPRESSIBLE NAVIER-STOKES

EQUATIONS VIA FEM

P. M. Gresho, Stevens T. K. Chan, Robert L. Lee, and Craig D Upson Jan. 1981 14 p refs Presented at the Intern. Conf on Numerical Methods for Laminar and Turbulent Flow, Venice 13 Jul. 1981

(Contract W-7405-eng-48)

(UCRL-85337) Avail: NTIS HC A02/MF A01

Simple techniques for solving the time dependent, three-dimensional incompressible Navier-Stokes equations via the finite element method are described. They involve (1) utilizing the trilinear 8-node isoparametric brick element for the velocity approximation (also for temperature and concentration where relevant) with piecewise-constant approximation of the pressure and (2) the time integration technique which is basically the explict forward Euler method, with the pressure obtained by solving the consistently derived Poisson equation. The advantages (speed and simplicity) and the disadvantages (stability limits on time-step size and the need to invoke mass lumping) of this technique are discussed and numerical examples presented. DOE

N81-30873# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung.

LECTURE ON THE SOLUTION OF STOCHASTIC DIFFERENTIAL EQUATIONS [VORTRAG UEBER DIE LOESUNG STOCHASTISCHER DIFFERENTIALGLEICHUNGEN]

Heinz Zehle 1980 32 p refs In GERMAN

Avail: NTIS HC A03/MF A01

Methods are presented for solving a class of stochastic differential equations frequently encountered in dynamic processes, namely of the form x dot = f(x, gamma(t),t), where gamma(t) describes a stochastic process which can either be stationary or nonstationary. In the latter case stationary solutions are given when the right hand side reduces to f(x,t) + 6(x,t)k(t), when k(t) pertains for instance to a white noise process or a physical process. Existence and uniqueness theorems and numerical integration procedures for these solutions are given. Ways in which solutions can be constructed by digital or analog simulation or by applying a diffusion type argument are also indicated.

Author (ESA)

N81-30874# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

SOME CONVERGENCE ESTIMATES FOR SEMIDISCRETE TYPE SCHEMES FOR TIME-DEPENDENT NONSELFADJOINT PARABOLIC EQUATIONS

Huang Mingyou and Vidar Thomee 1980 35 p refs

(CTH-Math-1980-17) Avail: NTIS HC A03/MF A01

The L2-norm error estimates for semidiscrete (continuous in time) Galerkin finite element type approximations to solutions of general time-dependent nonselfadjoint second order parabolic equations under Dirichlet boundary conditions are shown. The semidiscrete solutions are defined in terms of given methods for the corresponding elliptic problem, such as the standard Galerkin method, in which the boundary conditions are satisfied exactly, but also methods for which this is not necessary. The results are proved by energy arguments and include estimates for the homogeneous equation with both smooth and nonsmooth initial data. Author (ESA)

N81-30875# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

A GAUSSIAN CORRELATION INEQUALITY FOR CERTAIN BODIES IN R TO THE NTH POWER

Christer Borell 1981 9 p refs

(CTH-Math-1981-2) Avail: NTIS HC A02/MF A01

One possible multidimensional (n greater than three) extension of the Pitt correlation inequality is proved. Frequent use is made of cap symmetrizations in R to the nth power, R being the set of all real numbers for which reason an exact definition is included. Several theorems and lemmas are presented and proved. Author (ESA)

N81-30876# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.

A MESH-PARAMETER CONTINUATION METHOD

S. J. Polak (Philips Gloeilampenfabrieken N. V., Eindhoven, Netherlands), A. Wachters (Philips Gloeilampenfabrieken N. V., Eindhoven, Netherlands), T. Beelen (Philips Gloeilampenfabrieken N. V., Eindhoven, Netherlands), and P. W. Hemker Sep. 1980 11 p refs Submitted for publication

(MC-NW-89/80) Avail: NTIS HC A02/MF A01

A robust method for the solution of a nonlinear partial differential equation is considered. A stepsize strategy for the predictor-corrector continuation (PCC) method is presented. The idea of mesh-continuation is introduced and applied in combination with the PCC method. Numerical results are shown for a one-dimensional semiconductor model problem and a suggestion for a two-dimensional implementation is given. Author (ESA)

N81-30877# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.

AN ANALYSIS OF ROSENBROCK METHODS FOR NONLINEAR STIFF INITIAL VALUE PROBLEMS

J. G. Verwer Sep. 1980 30 p refs Submitted for publication

(MC-NW-90/80) Avail: NTIS HC A03/MF A01

The Rosenbrock integration method, when applied to a stiff system of the form scalar x = f(t,x,y,epsilon) + (1/epsilon) A(+)y, scalar y = g(t,x,y,epsilon) + (1/epsilon) mul(+)By, is analyzed. This equation possesses the following desirable model properties: (1) it permits the simultaneous occurrence of smooth and transient solution components; (2) it contains a small parameter admitting a transition to arbitrarily high stiffness (3) the Jacobian matrix has a time dependent eigen-system and (4) it contains nonlinear terms. Provided certain assumptions are satisfied, another characteristic of this equation is that for given initial vectors x(0) = x sub 0, y(0) = y sub 0, double modulus x(t,epsilon) = O(1), double modulus y(t,epsilon) = O(epsilon), epsilon tends to 0, t belongs to 0,T), T finite. Criteria which guarantee a similar behavior for finite sequences of Rosenbrock approximations are obtained. By way of comparison dimensional stability properties of the Rosenbrock method are studied. Author (ESA)

N81-30878# National Physical Lab., Teddington (England). Div of Numerical Analysis and Computer Science.

SOLVING A LEAST SQUARES PROBLEM WITH ONE MULTIPLICATIVE NONLINEARITY

M. G. Cox, W. M. Gentleman (Waterloo Univ., Canada), and J. G. Hayes Jan 1981 33 p refs

(NPL-DNACS-40/81; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

A class of least squares problems is considered in which all but one of the variables appear linearly and the single nonlinear variable occurs multiplicatively. Algorithms are presented for solving such problems which are based on (1) the normal equations approach and (2) the use of orthogonal transformations, and which exploit fully the structure of this problem. Methods for extracting auxiliary statistical information are also examined.

Author (ESA)

N81-30879# Sheffield Univ. (England). Dept. of Control Engineering.

INTRODUCTION TO KALMAN FILTERS

S. A. Billings Oct. 1980 8 p Presented at IEE Colloq. on Kalman Filters and their Appl., 17 Nov. 1980

(RR-127) Avail: NTIS HC A02/MF A01

Kalman-Bucy filters designed such that the estimate is best in the sense that the expected value of the sum of the squares of the error in the estimate are minimum are described. Equations giving the time varying optimal estimator and a schematic diagram of the Kalman-Bucy filter are presented. The use of Kalman filters to estimate the state of a nonlinear system by linearizing the system equations around a nominal solution is explained. The possibility of applying vector-matrix manipulations to the Kalman filter equations to obtain a number of equivalent forms is mentioned. Author (ESA)

N81-30880# Sheffield Univ. (England). Dept. of Control Engineering.

AN ABSTRACT SETTING FOR NONLINEAR DISTRIBUTED MULTIPASS PROCESSES

S. P. Banks 1980 23 p refs

(RR-138) Avail: NTIS HC A02/MF A01

The existence, uniqueness and stability of differential difference equations in Banach space are studied in order to

provide precise results in the theory of multipass processes. The general set-up of the system equations is discussed. Lyapunov methods are examined and a frequency domain stability criterion, the circle theorem, is developed. Examples are given to illustrate the theory. Under fairly mild conditions it is shown that a local (in time) solution exists and that by placing other restrictions on the system the solution may be extended for a finite time. The circle theorem is also generalized to the case of nonlinear differential difference equations in a Hilbert space. The examples given are of the diffusion type but the method also works for hyperbolic systems such as the wave equation. Author (ESA)

N81-30881# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
A NONLINEAR EVOLUTION PROBLEM ARISING IN THE PHYSICS OF IONIZED GASES
D. Hilhorst Dec. 1980 40 p refs Submitted for publication
(MC-TW-210/81) Avail: NTIS HC A03/MF A01

An experimental situation involving a Coulomb gas in a pre-breakdown gas discharge between two electrodes is considered. Physical equations are derived for the motion of the ions and electrons. Maximum principles for some degenerate parabolic operators (uniqueness theorem) are proved, the appropriate theorems being exposed. The existence and regularity of the solution to the nonlinear degenerate parabolic problem studied are examined. The asymptotic stability of the steady state and the rate of convergence of the solution towards the steady state are investigated. An equation for the negative charge density can be formulated as a nonlinear parabolic equation, which is degenerate at the origin. The existence and uniqueness of the solution is proved as well as the asymptotic stability of its unique steady state. Some results are given on the rate of convergence. Author (ESA)

N81-30882# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
PUSHED TRAVELLING WAVES IN AN INITIAL-BOUNDARY VALUE PROBLEM FOR FISHER TYPE EQUATIONS
E. J. M. Veling Dec. 1980 30 p refs Submitted for publication
(MC-TW-211/81) Avail: NTIS HC A03/MF A01

The initial boundary value problem for the semilinear diffusion equation u sub(t) equals u sub(xx) + f(u) on the half-line x > 0 is considered for f(0) equals f(1) equals 0 and f(u) > 0 when 0 < u < 1. This equation can serve as a model for the spread of an allele (A) in a diploid population with zygotes AA Aa and aa. A uniformly valid asymptotic expression with exponentially converging solutions is given for a wide class of initial and boundary values. This expression is composed of a travelling wave with a minimum velocity c(f) > 2 square root of f prime (0) and a solution to the stationary problem.
Author (ESA)

N81-30883# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
DIPS AND SLIDINGS OF THE FORCED VAN DER POL RELAXATION OSCILLATOR
J. Grasman Mar. 1981 15 p refs
(MC-TW-214/81) Avail: NTIS HC A02/MF A01

The Van der Pol equation with a sinusoidal forcing term: d squared x/d t squared + nu (x squared - 1) dx/dt + x = (alpha nu + beta) cost is considered for large values of the parameter nu and with 0 <alpha< 2/3. Characteristic regions of the x,t plane in which the solution exhibits various different behaviors are presented. Various asymptotic cases are investigated. Local solution approximations are constructed with singular perturbation techniques. Specific solutions which follow the unstable branch of a local oscillator approximation equation are studied. Author (ESA)

N81-30884# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
PRELUDE TO HOPF BIFURCATION IN AN EPIDEMIC MODEL: ANALYSIS OF A CHARACTERISTIC EQUATION ASSOCIATED WITH A NONLINEAR VOLTERRA INTEGRAL EQUATION
O. Diekmann and R. Montijn Mar. 1981 18 p refs Submitted for publication
(MC-TW-215/81) Avail: NTIS HC A02/MF A01

A simple deterministic model for the spread of an infectious disease, conferring only temporary immunity, in a closed population is discussed. The model leads to a nonlinear Volterra integral equation of the convolution type. The bifurcation of periodic solutions from a constant solution (the endemic state) with varying population size is of interest. The considerations developed led to the study of a characteristic equation. The main results obtained present a detailed description (in terms of Fourier coefficients of the kernel) of the traffic roots across the imaginary axis. The following corollary was obtained: when the period of immunity is longer than the preceeding incubation period and infectivity, then the endemic state is unstable for large population sizes and at least one periodic solution will arise. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N81-30885# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ALGORITHMS FOR MINIMIZATION OF FUZZY FUNCTIONS AND INCOMPLETELY SPECIFIED FUZZY FUNCTIONS [ALGORITHMS DE MINIMIZACAO DE FUNCOES DE CHWEAMENTO NEBULOSAS]
Orion de Oliveira Silva and Guaraci Jose Erthal Apr. 1981 81 p refs In PORTUGUESE; ENGLISH summary Presented at Reuniao Ann. da SBPC, Rio de Janeiro, 6-12 Jul. 1980
(INPE-2039-RPE/294) Avail: NTIS HC A05/MF A01

An algebraic approach is used to analyze fuzzy switching functions. A technique for fuzzy function minimization is presented and extended to the class of incompletely specified fuzzy functions. An overview of the theory of decision rule induction is presented. Computer programs for minimization of fuzzy functions and for decision rule induction are presented. These investigations are applicable to decision rule problems with fuzzy premises and/or fuzzy conclusions. J.D.H.

N81-30886# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
GENERATION OF SOME FIRST-ORDER AUTOREGRESSIVE MARKOVIAN SEQUENCES OF POSITIVE RANDOM VARIABLES WITH GIVEN MARGINAL DISTRIBUTIONS
A. J. Lawrence (Birmingham Univ., England) and P. A. W. Lewis Mar. 1981 38 p refs
(AD-A101645; NPS55-81-003) Avail: NTIS HC A03/MF A01 CSCL 12/1

Methods for simulating dependent sequences of continuous positive-valued random variables with exponential uniform, Gamma, and mixed exponential marginal distributions are given. In most cases the sequences are first-order, linear autoregressive, Markovian processes. A very broad two-parameter family of this type, GNEAR(1), with exponential marginals and both positive and negative correlation is defined and its transformation to a similar multiplicative process with uniform marginals is given. It is shown that for a subclass of this two-parameter family extension to mixed exponential marginals is possible, giving a model of broad applicability for analyzing data and modelling stochastic systems, although negative correlation is more difficult to obtain than in the exponential case. Finally, two schemes for autoregressive sequences with Gamma distributed marginals are outlined. Efficient simulation of some of these schemes is discussed. Author (GRA)

N81-30887# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
THE NEW NAVAL POSTGRADUATE SCHOOL RANDOM NUMBER PACKAGE: LLRANDOMII
Peter A. W. Lewis and Luis Uribe Feb. 1981 15 p refs
(AD-A101649; NPS55-81-005) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report describes the usage of LLRANDOMII, an IBM 370 set of Assembly Language programs which generate arrays of integer and real (floating point) pseudo random numbers, as

well as arrays of Normal, Exponential, Gamma, Cauchy, Poisson and Geometric random deviates. In addition the package will generate order statistics associated with these deviates. A shuffled version of the two basic random number generators in the package can be used for greater statistical reliability. Timings for these very fast subroutines are given, as well as timings for comparable IMSL Chapter G. subroutines. Author (GRA)

N81-30888# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
THE UNIFORM ASYMPTOTIC EXPANSION OF A CLASS OF INTEGRALS RELATED TO CUMULATIVE DISTRIBUTION FUNCTIONS
N. M. Temme Feb. 1981 25 p refs Submitted for publication
(MC-TW-212/81) Avail: NTIS HC A02/MF A01

An asymptotic expansion is given for a class of integrals for large values of a parameter which corresponds with the degrees of freedom in a certain type of cumulative distribution functions. The expansion is uniform with respect to a variable related to the random variables of the distribution functions. Special cases include the chi-square distribution and F distribution. R.C.T.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N81-30889*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AUTOMATED DECISION MAKING AND PROBLEM SOLVING. VOLUME 1: EXECUTIVE SUMMARY
Ewald Heer Aug. 1981 55 p refs Conf. held at Hampton, Va., 19-21 May 1980 2 Vol.
(NASA-CP-2180; L-14396) Avail: NTIS HC A04/MF A01 CSCL 12B

The May 1980 conference is summarized. Related topics in artificial intelligence, operations research, and control theory were explored. Existing techniques were assessed, trends of development determined, and potential for application in NASA automation technology programs were identified. Formal presentations were made by experts in the three disciplines nd a workshop was held in which current technology in automation and possible NASA interfaces with the academic community to advance this technology were discussed. J.D.H.

N81-30890# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Electrical Engineering Div.
IDENTIFICATION OF MULTIVARIATE LINEAR SYSTEMS
J. M. Griffith 1981 6 p refs Presented at the 27th Intern. Instr. Symp., Indianapolis, 27 Apr. 1981
(Contract DE-AC07-76ID-01570)
(CONF-810406-5) Avail: NTIS HC A02/MF A01

The problem of modeling multivariate linear systems where noisy output measurements are the only available data is considered. The techniques presented are valid for a class of canonical forms. Results from several simulations demonstrate the capability for structure and parameter estimation. DOE

N81-30891# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
DISTRIBUTION OF INTEGER EFFORT WITH A SLACK CONSTRAINT
Zeev Zeitlin 1980 12 p refs
(CTH-Math-1980-19) Avail: NTIS HC A02/MF A01

The optimality conditions which generalize the results with strict constraints in effort distribution models are presented. Practical aplicability to various operations research logistics problems is claimed. Resource allocation problems where the distribution functions are assumed to be concave but not necessarily monotonic are considered. The integer variables are limited by maximum value constraints. A simple solution algorithm employing the optimality conditions is presented. Author (ESA)

N81-30892# Sheffield Univ. (England). Dept. of Control Engineering.
NONLINEAR PERTURBATIONS OF DYNAMICAL SYSTEMS WITH BOUNDED INPUTS
S. P. Banks Oct. 1980 13 p refs
(RR-129) Copyright. Avail: NTIS HC A03/MF A01

Results regarding systems where the input is subjected to bounded restrictions are generalized to the case of nonlinear systems subjected to nonlinear perturbations by imposing certain restrictions on the unperturbed free system. The nonlinear variations of constants formula are discussed and used to obtain bounds on the system states. The application of this formula to obtain state bounds assuming a bounded control is presented, and a Lyapunov type approach to the same problem is discussed. A simple example is presented to illustrate the theory. It is shown that the two approaches bring out different aspects of the problem, but no direct comparison is attempted since taking norms in different ways leads to conservative results. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N81-30893 Brandeis Univ., Waltham, Mass.
ONE-LOOP GRAVITON-GRAVITON SCATTERING VIA MASSLESS SCALARS Ph.D. Thesis
John Walter Anthony Zak 1981 129 p
Avail: Univ. Microfilms Order No. 8116413

A one loop graviton-graviton scattering amplitude is explicitly computed for the case where the loops consist of massless scalars. Expressions for the helicity amplitudes are determined and reveal nonconservation. In the course of calculating these results, the ultraviolet and infrared divergences are treated by applying the technique of dimensional regularization and are shown to vanish (in agreement with general theorems). The various Feynman diagrams are found to be individually infrared finite, whereas, the ultraviolet infinities vanish only upon summation of the contributions from all of the graphs. Dissert. Abstr.

N81-30894# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VECTOR FIELDS, LINEAR SPACES, AND TENSORS IN PHYSICS. PART 1: VECTORS, FIELDS, AND COORDINATES [CAMPOS VETORIAIS, ESPACOS LINEARES E TENSORES NA FISICA. PARTE 1: VETORES, CAMPOS E COORDENADAS]
Rene A. Medrano-B Mar. 1981 149 p refs In PORTUGUESE; ENGLISH summary
(INPE-2028-RPE/289-Pt-1) Avail: NTIS HC A07/MF A01

Vectors are studied from the point of view of their handling in vectorial equations using the indicial notation. A study on vector fields as they are commonly found in physics (gradient, divergence, and curl) is also presented. Finally, an extension of the study of vector fields in orthogonal curvilinear coordinates using the indicial notation is presented. The development of each of these items is supplemented by examples and proposed problems. M.G.

N81-30895# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INDUCTION AND FUZZINESS IN RULES OF DECISION [INDUCAO E NEBULOSIDADE EM REGRAS DE DECISAO]
Orion deOliveiraSilva and Celso deRennaeSouza Jan. 1981 106 p refs In PORTUGUESE; ENGLISH summary Presented at the 32nd Reuniao Anual da SBPC, Rio de Janeiro, 6-12 Jul. 1980
(INPE-1976-RPE/281) Avail: NTIS HC A06/MF A01

Results found in the literature are presented, covering topics in inductive logic, in the theory of fuzzy sets (including entropic measures), and in the relationship between fuzzy and multi-valued logic. Results obtained in the study of the decision rule induction problem are then presented. The problem is taken as proposed by Larson and Michalski, with extensions based on the nature

of the rule's premises and conclusion (boolean or fuzzy ones)
M.G

N81-30896# Chalmers Univ. of Technology, Goteborg (Sweden) Dept. of Mathematics.
AN INTERPRETATION OF MARTIN-LOEF'S TYPE THEORY IN A TYPE FREE THEORY OF PROPOSITIONS
Jan Smith Dec. 1980 40 p refs
(CTH-Math-1980-20) Avail: NTIS HC A03/MF A01

A formal theory of propositions and combinator terms is presented with Frege structures as models. The basic notions of the theory are propositions and true proppositions formed by means of logical operations. The interpretation of the type theory within the logical theory is based on the semantical explanation of the type theory given by Martin-Loef excluding the type of well orderings. Intuition leading to logical theory is taken from Aczel. The construction of the interpretation can also be viewed as a formalized realizability interpretation.
Author (ESA)

N81-30897# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
EXPRESSIVENESS AND THE COMPLETENESS OF HOARE'S LOGIC
J. A. Bergstra (Leiden Univ.) and J. V. Tucker Oct. 1980 23 p refs Submitted for publication
(MC-IW-149/80) Avail: NTIS HC A02/MF A01

Several theorems about the completeness of Hoare's logic for the partial correctness of while-programs when implemented with a first order assertion language are proved. It is shown that the expressiveness of the assertion language is not to be a necessary condition on a structure for its Hoare logic to be complete and that a complete number theory is the only extension of Peano arithmetic which yields a logically complete Hoare logic. In addition a computable structure with ennumeration is shown to be expressive if, and only if, its Hoare logic is complete. Author (ESA)

N81-30898# Kaiserslautern Univ. (West Germany). Fachbereich Mathematik.
AN APPROXIMATION RESULT FOR NORMAL INTEGRANDS AND APPLICATIONS TO RELAXED CONTROL THEORY
Giorgios S. Pappas 1980 12 p refs Submitted for publication
(Preprint-16) Avail: NTIS HC A02/MF A01

Normal integrands are related to the Caratheodory functions which play a central role in the theory of existence of solutions to ordinary differential equations. Every normal integrand is shown to be a pointwise limit of an increasing sequence of Caratheodory functions. This approximation result is viewed as a generalization of the fact that every bounded semicontinuous function defined on a separable locally compact metric space is the limit of a monotone sequence of continuous functions with compact supports. This enables the range of application of the relaxed control functions to be extended to functions only sometimes semicontinuous in the control variable. An existence of solutions theorem for a general optimal control problem is given, with the characteristic that the cost functional is expressed as the integral of a function only lower-semicontinuous in the state and control variables. Author (ESA)

N81-30899# Sheffield Univ. (England). Dept. of Control Engineering.
THE CIRCLE THEOREM FOR NONLINEAR PARABOLIC SYSTEMS
S. P. Banks 1980 12 p refs
(RR-132) Avail: NTIS HC A02/MF A01

A simple geometrical criterion for the input output stability of the system, consisting of a generalization of the circle theorem to the case of nonlinear parabolic systems is presented. An elementary proof is given and the critical disk is related directly to the spectrum of the operator (and the boundary conditions) defining the linear part of the system. This is made possible by using the spectral mapping theorem applied to the semigroup of the system. Standard notation for Hilbert spaces and semigroup theory is used. The proposed method is shown useful in many cases when the boundary conditions make the determination of the spectrum of the operator very simple.
Author (ESA)

N81-30900# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
HOARE'S LOGIC AND PEANO'S ARITHMETIC
J. A. Bergstra (Leiden Univ.) and J. V. Tucker Feb. 1981 30 p refs Submitted for publication
(MC-IW-160/81) Avail: NTIS HC A03/MF A01

A proof of Hoare's logic for the partial correctness of while-programs applied to arithmetic as defined by Pano's axioms is developed. The verification of programs in N arithmetic is considered without the privilege of N being on outright given structure and with the restriction that N must be axiomatically defined. The verification of an entirely proof-theoretic basis in Hoare's logic is studied. Proofs are given on what can be derived from arithmetic and on what can be stated about N in a specification. A representation of the strongest postcondition calculus in Peano arithmetic PA enables Hoare's logic over PA to be shown to be equivalent to PA itself. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N81-30901# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MATHEMATICAL METHODS IN PHYSICS 5: FOURIER SERIES [METODOS MATEMATICOS DA FISICA V: SERIE DE FOURIER]
Rene A. Medrano-B Oct. 1980 75 p refs In PORTUGUESE, ENGLISH summary
(INPE-1933-RPE/256) Copyright. Avail: NTIS HC A04/MF A01

An introduction to the Fourier series is presented. With the definition of harmonic functions, the Fourier series is defined in terms of the trigonometric functions. The convergence criteria (uniform and quadratic in the mean) and the conditions under which a function can be Fourier analyzed are studied. Then, an analysis of the Gibbs phenomenon and the implications of differentiating or integrating the Fourier series are discussed. A Fourier analysis of a non-periodic function and an introduction to the study of periodicities in experimental data are given. The complex form of the Fourier series is presented and its application to the two dimensional Fourier analysis of a function with two independent variables is introduced. M.G.

N81-30902# Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
CALORIMETRIC DETERMINATION OF ABSORBED DOSE IN WATER FOR 1-25 MeV X-RAYS
G. H. Hofmeester 1980 29 p refs Presented at Intern. Symp. on Biomedical Dosimetry: Physical Aspects, Instrumentation, Calibration, Paris, 27-31 Oct. 1980 Submitted for publication
(IAEA-SM-249/56) Avail: NTIS HC A03/MF A01

The conversion of absorbed doses in graphite to absorbed doses in water was studied. A method employing a thin walled ionization chamber as a transfer device was developed. A commercial secondary standard therapy level exposure meter was used in one of the determinations. In the other determination, the difference between the electron densities in the two media was taken into account in the absorbed dose calculations. These absorbed dose determinations in water were compared with ionometrically determined doses obtained using the C sub lambda concept or the conversion factors according to the NACP protocol. The dispersions of conventional absorbed dose determinations performed in 11 different hospitals are given (+3 to -5%). The underevaluation of the C sub lambda concept is 1.5% in the 5 to 8 MeV range, 2% in the 16 to 18 MeV range, and 4% at 25 MeV. Author (ESA)

N81-31078*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN FREQUENCY AND TIMING SYSTEM MARK 3-81

J. B. Curtright *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 41-52 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 17B

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N81-30903*# Virginia Associated Research Center, Newport News.
SOUND MEASUREMENTS OF THE MOD-2 WIND TURBINE GENERATOR
H. H. Hubbard, K. P. Shepherd (Bionetics Corp., Hampton, Va.), and F. W. Grosveld (Bionetics Corp., Hampton, Va.) Jul. 1981 30 p refs
(Contract NAS1-14970; Grant NAG1-166)
(NASA-CR-165752) Avail: NTIS HC A03/MF A01 CSCL 20A

Sound measurements were made for the MOD-2 wind turbine generator for wind conditions of 7.6 to 13.4 m/sec and for output power ratings of about 1 to 2 NW. Both broad band and narrow band data wre obtained for a range of distances and azimuth angles from the machine. The rotor sound spectra are random in character and peak in the frequency ranges 30 to 50 Hz and 800 to 1300 Hz. Both peaks are predictable from experience with helicopter rotors and propellers. Results suggest that the lower frequency peak is due to the effects of inflow turbulence and the higher frequency peak is due to the interactions of the turbulent boundary layers with the trailing edges of the blades. The boundary layer related sound is the dominant component in the audible frequency range and determines the detectability of the machine. It could be detected at a distance of 1350 m in the upwind direction where the background noise was 30 dB (A) and at distances in excess of 2100 m in the downwind direction. Discrete frequency sound components associated with the power generation equipment are measurable in the direction normal to the axis of rotation but are not believed to be significant for detection or community response. M.G.

N81-30904*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
A STUDY OF METHODS OF PREDICTION AND MEASUREMENT OF THE TRANSMISSION OF SOUND THROUGH THE WALLS OF LIGHT AIRCRAFT
B. Forssen, Y. S. Wang, P. K. Raju, and Malcolm J. Crocker Aug. 1981 159 p refs
(Grant NAG1-58)
(NASA-CR-164712; HL-81-19; Rept-1) Avail: NTIS HC A08/MF A01 CSCL 20A

The acoustic intensity technique was applied to the sound transmission loss of panel structures (single, composite, and stiffened). A theoretical model of sound transmission through a cylindrical shell is presented. S.F.

N81-30905*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFLUENCE OF EXIT IMPEDANCE ON FINITE DIFFERENCE SOLUTIONS OF TRANSIENT ACOUSTIC MODE PROPAGATION IN DUCTS
K. J. Baumeister 1981 16 p refs Proposed for presentation at the Winter Ann. Meeting of the ASME, Washington, D.C., 15-20 Nov. 1981
(NASA-TM-82666; E-940) Avail: NTIS HC A02/MF A01 CSCL 20A

The time-dependent governing acoustic-difference equations and boundary conditions are developed and solved for sound propagation in an axisymmetric (cylindrical) hard-wall duct without flow and with spinning acoustic modes. The analysis begins with a harmonic sound source radiating into a quiescent duct. This explicit iteration method then calculates stepwise in real time to obtain the steady solutions of the acoustic field. The transient method did not converge to the steady-state solution for cutoff acoustic duct modes. This has implications as to its use in a variable-area duct, where modes may become cutoff in the smal-area portion of the duct. For single cutoff mode propagation the steady-state impedance boundary condition produced acoustic reflections during the initial transient that caused finite instabilities in the numerical calculations. The stability problem is resolved by reformulating the exit boundary condition. Example calculations show good agreement with exact analytical and numerical results for forcing frequencies above, below, and nearly at the cutoff frequency. Author

N81-30906*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOTE ON REFLECTION AND TRANSMISSION COEFFICIENTS FOR CONVERGING-DIVERGING DUCTS
Paul A. Durbin Sep. 1981 10 p refs
(NASA-TM-82679; E-964) Avail: NTIS HC A02/MF A01 CSCL 20A

Simple formulas for calculating acoustic reflection and transmission coefficients for converging-diverging ducts are derived; they extend the method of Cho and Ingard to arbitrary, slowly varying ducts. These formulas involve two parameters. The first is a function of duct shape and the second is the ratio of the duct radius downstream of the throat to that upstream of the throat to the upstream of the throat. An extension of the method to include mean flow is made for symmetric ducts. M.G.

N81-30907*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONDITIONED PRESSURE SPECTRA AND COHERENCE MEASUREMENTS IN THE CORE OF A TURBOFAN ENGINE
Allen Karchmer 1981 10 p refs Presented at 7th Aeroelastic Conf., Palo Alto, Calif., 5-7 Oct. 1981; sponsored by AIAA
(NASA-TM-82688; E-970; AIAA-Paper-81-2052) Avail: NTIS HC A02/MF A01 CSCL 20A

Multiple and partial coherence functions and the corresponding conditioned coherent output spectra are computed between fluctuating pressures measured at two locations within the tailpipe of a turbofan engine and far-field acoustic pressure. The results are compared with the ordinary coherent output spectrum as obtained between a single tailpipe pressure measurement and the far-field acoustic pressure. The comparison indicates apparent additional 'coherent output' (i.e., core-noise) beyond that detectable with an ordinary coherent measurement, thus suggesting the tailpipe as a core-noise source region. Further evidence suggests, however, that these differences may be attributed to the presence of transverse acoustic modes in the tailpipe and that the tailpipe is not, in fact, a significant source region. Author

N81-30908*# Lockheed-Georgia Co., Marietta.
SHOCK ASSOCIATED NOISE REDUCTION FROM INVERTED-VELOCITY-PROFILE COANNULAR JETS Final Report
H. K. Tanna, C. K. W. Tam, and W. H. Brown Aug. 1981 161 p refs
(Contract NAS1-15971)
(NASA-CR-3454; LG81ER0162) Avail: NTIS HC A08/MF A01 CSCL 20A

Acoustic measurements show that the shock noise from the outer stream is virtually eliminated when the inner stream is operated at a Mach number just above unity, regardless of all the other jet operating conditions. At this optimum condition, the coannular jet provides the maximum noise reduction relative to the equivalent single jet. The shock noise reduction can be achieved at inverted-as well as normal-velocity-profile conditions, provided the coannular jet is operated with the inner stream just slightly supersonic. Analytical models for the shock structure and shock noise are developed indicate that a drastic change in the outer stream shock cell structure occurs when the inner stream increases its velocity from subsonic to supersonic. At this point, the almost periodic shock cell structure of the outer stream nearly completely disappears the noise radiated is minimum. Theoretically derive formulae for the peak frequencies and intensity scaling of shock associated noise are compared with the measured results, and good agreement is found for both subsonic and supersonic inner jet flows. A.R.H.

N81-30909# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOUND WAVES IN FLUIDS TAKING INTO ACCOUNT CHEMICAL REACTIONS AND RADIATION M.S. Thesis - 14 Mar. 1980 [ONDAS ACUSTICAS EM FLUIDOS COM REACAO QUIMICA E RADIACAO]
Iara Regina Cardoso deAlmeida Feb. 1981 70 p refs In PORTUGUESE; ENGLISH summary
(INPE-1997-TDL/039) Copyright. Avail: NTIS HC A04/MF A01

The propagation of sound waves in a fluid was studied with respect to chemical reaction and radiation. A theoretical development was performed, starting from the thermodynamics of irreversible process formulation. An expression for the attenuation of sound was obtained, from which it was possible to infer that radiation diminishes the propagation of sound waves. R.C.T.

N81-30910# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
NOISE ABATEMENT TECHNOLOGY OPTIONS FOR CONVENTIONAL TURBOPROP AIRPLANES Final Report
William J. Galloway and John F. Wilby Jun. 1981 115 p refs
(Contract DOT-FA78WAI-4190)
(AD-A101828; BBN-4220; FAA-EE-80-19) Avail: NTIS HC A06/MF A01 CSCL 20/1

The practical application of noise control technology to new and derivative conventional turboprop airplanes likely to come into service in the 1980's has been analyzed with a view to determining noise control cost/benefits. The analysis identifies feasible noise control methods, applies them to four study airplanes, and presents the noise reductions in terms of the equivalent perceived noise level at takeoff, sideline and approach locations, and the effect on the area within selected EPNL contours. Noise reductions of up to 8.3 dB for takeoff and 10.7 dB for approach are calculated for the study airplanes but, for most cases, the changes are less than 5 dB. Weight and cost increases associated with the noise control treatments are determined under the assumption that they are no changes to airplane performance or fuel consumption. Author (GRA)

N81-30911# Boeing Vertol Co., Philadelphia, Pa.
IMPACT OF PREDICTION ACCURACY ON COSTS - NOISE TECHNOLOGY APPLICATIONS IN HELICOPTERS Final Report
R. H. Spencer and J. Sternfeld, Jr. Jun. 1981 49 p refs
(Contract DOT-FA78WA-4161)
(AD-A101768; FAA/EE-81-10) Avail: NTIS HC A03/MF A01 CSCL 20/1

This study is an extension of the work reported in AD-A083 935, and considers the effect which uncertainties in the prediction and measurement of helicopter noise have on the development and operating costs. Although the number of helicopters studied is too small to permit generally applicable conclusions, the following are the primary results: (1) the Effective Perceived Noise (EPN) Levels tended to be overpredicted for takeoffs, underpredicted for approaches, with no general trend noted for level flyovers; (2) prediction accuracy for the cases studied ranged from 1 to 6 EPNdB; and (3) test and measurement repeatability can give a range of up to 3 EPNdB. Each helicopter must be studied as an individual case and generalization of cost trends should be avoided. GRA

N81-30912# Southampton Univ. (England). Inst. of Sound and Vibration Research.
EFFECT OF BARRIERS ON PROPAGATION OF CONSTRUCTION NOISE
H. S. Gill Dec. 1980 103 p refs
(ISVR-TR-113) Avail: NTIS HC A06/MF A01

Comparison of measurements with over 400 separate predictions for wedge-shaped barriers of bare compacted earth shows that Maekawa's thin barrier theory is adequate for predicting A weighted barrier attenuation for construction noise sources. The mean discrepancy between measured and predicted barrier attenuation was 0.5 dB (A). Kurze's wide barrier theory predicted A weighted barrier attenuation with reasonable accuracy. The mean deviation between measured and predicted barrier attenuation was 2.0 dB (A), theory generally overpredicting. Other studies with a controlled loudspeaker source show the thin barrier theory to be suitable for predictions with cuttings whose sides are covered very sparsely with grass. Attenuations afforded by real, full sized cuttings and embankments whose sides and edges are covered with densely grown grass or loose shingle are 5 dB greater than Maekawa predictions. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N81-30913 Michigan Univ., Ann Arbor.
LASER SPECTROSCOPY OF BIOLOGICALLY IMPORTANT MOLECULES Ph.D. Thesis
Jeanne Privette Haushalter 1981 178 p
Avail: Univ. Microfilms Order No. 8116251

A coherent Raman spectroscopic technique, A.C. -coupled inverse Raman spectroscopy; was developed. A system design for obtaining high quality spectra is described. The A.C. -coupled inverse Raman spectroscopy is shown to give Lorentzian bands, analogous to those obtained in spontaneous Raman spectroscopy, when both lasers are tuned away from an electronic resonance of the sample molecule. However, under resonance enhancement conditions, band shapes are shown to depart from Lorentzian shapes. A theoretical description of the excitation frequency dependence of band shape is presented and shown to match results of experiment. Resonance inverse Raman spectra of highly luminescent molecules including acridine orange and some substituted flavins are reported. The initial experiments in the development of a thermal blooming technique for monitoring enzymatic reaction rates are described. Thermal blooming is shown to be a viable method for making absorption measurements of dynamic systems at low concentration. The technique can be applied to differential catecholamine assay. Dissert. Abstr.

N81-30914 Illinois Univ. at Urbana-Champaign.
CHARACTERIZATION OF STRUCTURE AND INTERFACIAL ENERGY TRANSFER OF MOLECULAR THIN FILMS Ph.D. Thesis
Shirley Gale Fischer 1981 156 p
Avail: Univ. Microfilms Order No. 8114420

A spin-coating device is used to fabricate thin films on the order of 2000-5000 A thick. These films are manufactured from casting solutions containing solvent, polymer, and a chromophore, usually fluoranthene. Onto this film, submonolayer amounts of perylene are deposited by a vacuum vapor deposition process. A fluorescence emission spectrum of this film assembly yields a predominant perylene feature, which is distinctly different from that of fluoranthene. Approximately 4 percent of the fluoranthene fluorescence intensity is quenched. This degree of quenching implies an energy transfer distance on the order of 100 A.
Dissert. Abstr.

N81-30915 Rice Univ., Houston, Tex.
PHOTOIONIZATION EXPERIMENTS IN A SUPERSONIC MOLECULAR BEAM Ph.D. Thesis
Mark Gregory Liverman 1981 137 p
Avail: Univ. Microfilms Order No. 8116975

The uses of resonance enhanced two-photon ionization (R2PI) for studying unimolecular energy redistribution of molecules in a supersonic molecular beam are explored. The R2PI process relies on initially exciting a molecule to a state that is stable with respect to the up-pumping rate of an ionizing laser field. For such situations, the ion signal produced is proportional to the population of the intermediate state. It is used in place of the observation of emitted light for measuring the populaton of an excited state. This is particularly useful for states that do not radiate. The pulsed value used to create th molecular beam is described in detail. Several experiments, undertaken to characterize the type of information that might be obtained, are described. From these it was determined that the R2PI technique has a detection efficiency of almost 100 percent. Dissert. Abstr.

N81-30916 Wyoming Univ., Laramie.
A NUCLEAR MAGNETIC RELAXATION STUDY OF THE MOLECULAR ROTATIONS OF ETHANE AND PROPANE Ph.D. Thesis
Dale Robert McKay 1980 193 p
Avail: Univ. Microfilms Order No. 8111607

Relaxation rates for deuterons, protons, and carbon-13 nuclei have been measured in liquid ethane and in the methyl and methylene groups of liquid propane. The proton intramolecular and intermolecular relaxation rates were separated by the dilution method. The carbon-13 dipolar and spin-rotation relaxation rates were separated by the NOE method. The relaxation rates were measured over the temperature range + 20 to -120 degrees centigrade. The carbon-13 and deuteron rates were found to obey the Arrhenius relation. Comparisons of the deuteron rates and the proton rates indicate that the intramolecular relaxation rates of the protons include dipolar and spin-rotation contributions. Dissert. Abstr.

N81-30917 North Carolina Univ. at Chapel Hill.
MOLECULAR ORIENTATIONAL CORRELATION AND MEMORY FUNCTIONS IN FLUIDS Ph.D. Thesis
Michael Denis Lahana 1980 123 p
Avail: Univ. Microfilms Order No. 8114834

The Mori projection operator formalism is applied to the problem of rotational Brownian motion of molecules in a fluid. The resulting integro-differential equation for molecular orientational correlation function has a kernel sometimes called a memory function. Examination of experimental correlation function data for various molecular fluids leads to the thesis that only a memory function containing a negative region is capable of reproducing the characteristic bends that are found in the experimental results. The integro-differential equation is solved by computer for various two and three parameter assumed forms for a memory function that goes negative, and the results compared with experiment. Some good agreement has been found and displayed. Theoretical values for the parameters of one of the assumed forms are calculated by expanding both the assumed form of the memory function and exact theoretical expression for the memory function in a power series in time, and demanding that terms of the lowest powers in time be equal. Dissert. Abstr.

N81-30918 Stanford Univ., Calif.
A MEASUREMENT OF THE RATE OF FORMATION OF PI-MU ATOMS IN NEUTRAL KAON SUB L DECAY Ph.D. Thesis
Robert Dacey Cousins, Jr. 1981 150 p
Avail: Univ. Microfilms Order No. 8115783

An experiment in which the rate of pi-mu atom formation is measured to an accuracy of twelve percent is discussed. The data were taken at the Fermi National Accelerator Laboratory using a high energy kaon beam and wire chamber spectrometer. Unbound pi-mu pairs from kaon decay were used for normalization. The results are close to theoretical expectations. In the same experiment, decays of the K-mesons to final states which included photons were observed. Dissert. Abstr.

N81-30919# Brookhaven National Lab., Upton, N. Y.
SOLAR NEUTRINO EXPERIMENTS AND NEUTRINO OSCILLATIONS
B. T. Cleveland, Raymond Davis, Jr., and J. K. Rowley 1981 14 p refs Presented at the Neutrino Oscillation Workshop, Upton, N.Y., 30 Jan. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29440; CONF-810135-3) Avail: NTIS HC A02/MF A01

A solar neutrino experiment was conducted that was based on the neutrino capture reaction, Cl-37(v,e(-))Ar-37. The experiment was built to test the theory of solar energy production. The results are compared to solar model calculations. DOE

N81-30920# Michigan State Univ., East Lansing. Dept. of Physics.
DATA MANAGEMENT DESIGN: NUCLEON-NUCLEON DATA BANK (0-1200 MeV)
Peter Signell and Fred Freiheit 10 Apr. 1981 23 p
(Contract DE-AC02-79ER-10516)
(DOE/ER-10516/6) Avail: NTIS HC A02/MF A01

This is a guide to the design of the on-line data records in this bank, covering all energies and particle combinations up to about 1200 MeV. The design of the bank's management system satisfies amost all of the conditions set forth in the proposed Design Princples for Physics Data Banks. DOE

N81-30921# Brookhaven National Lab., Upton, N. Y.
NEUTRON-TRANSPORT EQUATION IN A GENERAL CURVELINEAR COORDINATE SYSTEM
H. Takahashi 1981 5 p refs Presented at the Am. Nucl. Soc. Ann. Meeting, Miami, Fla., 7-12 Jun. 1981
(Contract DE-AC02-76CH-00016)
(BNL-28899; CONF-810606-24) Avail: NTIS HC A02/MF A01

Different from a fission reactor, a fusion reactor has complex geometry, such as toroidal geometry. A neutron transport equation for the toroidal cordinate system was derived by using coordinate transformation from the cartesian coordinate. These methods require rather tedious calculations. A simple method is presented to formulate the neutron transport equation in the general curvelinear coordinate system. The equations for parabolic cylinder and toroidal coordinate systems are derived as an example. DOE

N81-30922# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
NEUTRINO MASS AND UNIFICATION
Goran Senjanovic 1981 18 p refs Presented at the Neutrino Oscillation Workshop, Upton, N.Y., 30 Jan. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29092; CONF-810135-1) Avail: NTIS HC A02/MF A01

Neutrino masses in grand unified theories are discussed. Particular is given to the question of intermediate mass scales and it is shown how they play a crucial role in the predictions for neutrino masses. The SU(5) and SO(10) models are covered, with SO(10) offering a possibility of low energy parity restoration and appreciable neutrino masses and lepton number violation. DOE

N81-30923# Los Alamos Scientific Lab., N. Mex.
LASER-INDUCED BREAKDOWN SPECTROSCOPY: A TECHNIQUE FOR ATOMIC DETECTION AND MOLECULAR IDENTIFICATION
T. R. Loree and L. J. Radziemski 1981 18 p refs Presented at the Conf. on Optics, Sante Fe, N. Mex., 7-10 Apr 1981
(Contract W-7405-eng-36)
(LA-UR-81-972; CONF-810429-6) Avail: NTIS HC A02/MF A01

The emission spectra from laser induced breakdown plasmas as a technique for atomic identification was used with time resolution to determine trace constituents in gases. Major focus was placed on the development of real time techniques for atomic detection with reasonable sensitivity. DOE

N81-30924# Oak Ridge National Lab., Tenn
DISCOVERING THE NATURE OF THINGS BY COUNTING THE ATOMS
G. S. Hurst 1981 38 p refs Presented at the Symp. in Honor of Lewis Cochran, Lexington, Ky., 10 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810441-1) Avail: NTIS HC A03/MF A01

The development of the theory of atoms is traced from Democritus to modern times. DOE

N81-30925# California Univ., Berkeley. Lawrence Berkeley Lab.
TOPICS IN THE THEORY OF HEAVY-QUARK SYSTEMS Ph.D. Thesis
Curt Alan Flory Apr. 1981 94 p refs
(Contract W-7405-eng-48)
(LBL-12558) Avail: NTIS HC A05/MF A01

Due to the kinematic and dynamic simplifications possible because of the large mass of heavy quark bound states, certain properties of these systems can be quantitatively analyzed within the framework of quantum chromodynamics (QCD). It is clear that dimensionally the size of the bound state is proportional to the inverse quark mass, and for very heavy quarkonia the radius

of the system should become smaller than that of normal hadrons. When this small system interacts with external long wavelength field quanta, the natural expansion that results is of a multipole type, analogous to the familiar multipole expansion in electrodynamics. This multipole expansion has better convergence properties than the standard perturbative treatment in certain kinematic regimes, which opens up a new area for strong interaction physics calculations. More specifically, it is ideally suited to investigate soft nonperturbative effects in QCD which appear to be so crucial to present day phenomenology and the conjectured confinement mechanism. DOE

N81-30926# Oak Ridge National Lab., Tenn. Computer Sciences Div.

CALCULATION OF NEUTRON AND GAMMA-RAY PRODUCTION CROSS SECTIONS FOR CALCIUM FROM 8 TO 20 MeV

D. M. Hetrick and C. Y. Fu Jun. 1981 45 p refs Sponsored in part by DNA

(Contract W-7405-eng-26)

(ORNL/TM-7752) Avail: NTIS HC A03/MF A01

Nuclear model calculations used for the previous evaluation for calcium lacked the effects of precompound particle emission. Experimental information now available suggests that these effects are significant from 8 to 20 MeV. Results of new calculation made to include such effects in all reaction cross sections from 8 to 20 MeV are presented. The resulting data set was prepared in the ENDF/B-V format and is referred to as Material 4152 Modification V in the DNA cross-section library. DOE

N81-30927# Calspan Corp., Buffalo, N. Y. Aerodynamic Research Dept.

VIBRATIONAL ENERGY-TRANSFER KINETICS IN MOLECULAR DISEQUILIBRIUM Progress Report

J. William Rich Mar. 1981 20 p refs

(Contract DE-AC02-79ER-10458)

(DOE/ER-10458/2) Avail: NTIS HC A02/MF A01

A continuous wave CO laser was used to excite the vibrational mode of CO in gas mixtures. High steady state excitation of the CO vibrational mode (0.3 eV/molecule) was achieved, while a translational-rotational temperature near 3000K was maintained by the steady flow of cold gas into the cell. Kinetics of the observed C2 formation were studied. Diagnostic experiments were conducted to detect reaction intermediates in the enrichment process. GRA

N81-30928# TRW Defense and Space Systems Group, Redondo Beach, Calif. Advanced Technology Lab.

METHOD OF ACTIVE CHARGE AND CURRENT NEUTRALIZATION OF INTENSE ION BEAMS FOR ICF

Z. G. T. Guiragossian, J. L. Orthel, D. S. Lemons, and L. E. Thode 1981 5 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981 Prepared in cooperation with Los Alamos National Lab., N. Mex.

(Contract DE-AC08-79DP-40109; W-7405-eng-36)

(LA-UR-81-1408; CONF-810314-160) Avail: NTIS HC A02/MF A01

Methods of generating the beam neutralization electrons with required properties are given in the context of a light ion fusion experiment (LIFE) designed accelerator. Recently derived envelope equations for neutralized and ballistically focused intense ion beams are applied to the LIFE geometry in which 10 MeV He(+) multiple beamlets coalesce and undergo 45:1 radial compression while beam pulses experience a 20:1 axial compression in the propagation range of 10 m. Both active and autoneutralization methods are examined and found to produce initial electron temperatures consistent with the requirement of the envelope equation for both radial and axial adiabatic beam pulse compressions. The stability of neutralized beam propagation is also examined concerning the Pierce type electrostatic instability and for the case of LIFE beams it is found to have insignificant effect. A scaled experimental setup is presented which serve to perform near term tests on the ballistically focused propagation of neutralized light ion beams. DOE

N81-30929# Brookhaven National Lab., Upton, N. Y.

NEW ASPECTS IN THE EVALUATION OF THERMAL NEUTRON CROSS SECTIONS

S. F. Mughabghab 1980 32 p refs Presented at Conf. on Nucl. Data Evaluation Methods and Procedures, Upton, N.Y., 22-25 Sep. 1980

(Contract DE-AC02-76CH-00016)

(BNL-NCS-29035; CONF-800979-16) Avail: NTIS HC A03/MF A01

A stringent approach in the evaluation of the thermal constants is developed. The following aspects are introduced: (1) a consistency between thermal cross sections, coherent and incoherent scattering lengths, and neutron resonance parameters is achieved; (2) a consistency between the isotopic and element cross sections is sought; in addition, for each isotope, the requirement that the partial cross sections add up to the total is fulfilled; (3) where possible, charged particle data particularly derived from (d,p) reactions on light and medium weight isotopes are used in locating the positions and strengths of bound levels. Such a procedure is useful in the evaluation of the shape of the cross sections in the thermal region; and (4) the Lane-Lynn theory of direct capture is called upon to calulate thermal cross sections and check for consistencies for certain isotopes. Extensive examples to illustrate these procedures are presented. DOE

N81-30930# Argonne National Lab., Ill.

PROCEEDINGS ON THE WORKSHOP OF FOUNDATIONS OF THE RELATIVISTIC THEORY OF ATOMIC STRUCTURE

Mar. 1981 310 p refs Workshop held in Argonne, Ill., 4-5 Dec. 1980

(Contract W-31-109-eng-38)

(ANL-80-126; CONF-810255) Avail: NTIS HC A14/MF A01

The development of relativistic theories of many-electron atoms is reviewed, with emphasis on the fact that the Dirca-Coulomb Hamiltonian H sub DC has no bound states. This fact implies that neither the DiracHartree-Fock (DHF) equations nor the DHF wavefunction chi have a simple theoretical interpretation. A no-pair Hamiltonian H sub + is defined which does not have the fatal flaw of H sub DC and hence can serve as a starting point for a systematic study of relativistic effects in many electron atoms which can go beyond central field approximations. H sub + differs from H sub DC by the presence of external field positive energy projection operators in the electron-electron interaction terms. Relativistic Hartree-Fock equations are obtained from H/sub + / and the relation between their solutions psi and the DHF solutions chi is discussed. The DHF equations may be reinterpreted as approximations to the new HF-type equations; this provides a rationale for their success in applications. DOE

N81-30931# California Univ., Livermore. Lawrence Livermore Lab

MOLECULAR POTENTIALS AND RELAXATION DYNAMICS

Arnold M. Karo 27 Mar 1981 47 p refs Presented at the United States NSF and Mexican Natl. Council of Sci. and Technol. Workshop, San Juan Del Rio, Mexico, 1-4 Apr. 1981 Submitted for publication

(Contract W-7405-eng-48)

(UCRL-85577; CONF-810442-2) Avail: NTIS HC A03/MF A01

The use of empirical pseudopotentials, in evaluating interatomic potentials, provides and inexpensive and convenient method for obtaining highly accurate potential curves and permits the modeling of core-valence correlation, and the inclusion of relativistic effects when these are significant. As an example, recent calculations of the chi and the a 3 Sigma + states of LiH, NaH, KH, RbH, and CsH and the chi 2 Sigma + states of their anions are discussed. Pseudopotentials, including core polarization terms, have been used to replace the core electrons, and this has been coupled with the development of compact, highly-optmized basis sets for the corresponding one- and two-electron atoms. Comparisons of the neutral potential curves with experiment and other ab initio calculations show good agreement (within 1000/cm over most of the potential curves) with the difference curves being considerably more accurate. DOE

N81-30932# California Univ., Livermore. Lawrence Livermore Lab.

MOLECULAR POTENTIAL AND RELAXATION DYNAMICS

Arnold M. Karo 18 May 1981 48 p refs Presented at the United States NSF and Mexican Natl. Council of Sci. and Technol. Workshop on Negative Ions, San Juan Del Rio, Mexico, 1-4 Apr. 1981 Revised Submitted for publication
(Contract W-7405-eng-48)
(UCRL-85577-Rev-1; CONF-810442-2-Rev-1) Avail: NTIS HC A03/MF A01

The collisional de-excitation of vibrationally excited molecular hydrogen at an Fe surface is considered. Calculations were carried out for an initial vibrotational state v = 8, J = 1 and a translational temperature corresponding to a gas temperature of 500 K. Different angles of approach and different initial random impact points on the surface were selected. For any given collision with the wall, the molecule may pick up or lose vibrotational translational energy. DOE

N81-30933# California Univ., Berkeley. Lawrence Berkeley Lab.
COMBUSTION DIAGNOSTICS BY TUNABLE ATOMIC LINE MOLECULAR SPECTROSCOPY
Enrique Cuellar and Nancy J. Brown Jan. 1981 7 p refs Presented at the 1st Intern. Specialists Meeting of the Combustion Inst., Bordeaux, France, 20 Jul. 1981
(Contract W-7405-eng-48)
(LBL-12127; CONF-810704-3) Avail: NTIS HC A02/MF A01

Tunable atomic line molecular spectroscopy was used to detect and measure S2 formed in the equilibrium vapor of elemental sulfur, and from the thermal decomposition of H2S. DOE

N81-30934# Argonne National Lab., Ill.
USE OF UNCERTAINTY DATA IN NEUTRON DOSIMETRY
L. R. Greenwood 1980 19 p refs Presented at the Workshop on Nucl. Data Evaluation Methods and Procedures, Upton, N.Y., 22-25 Sep. 1980
(Contract W-31-109-eng-38)
(CONF-800979-21) Avail: NTIS HC A02/MF A01

Uncertainty and covariance data are required for neutron activation cross sections and nuclear decay data used to adjust neutron flux spectra measured at acceleration and reactors. Covariances are evaluated in order to assess errors in derived damage parameters, such as nuclear displacements. The primary sources of error are discussed along with needed improvements in presently available uncertainty data. DOE

N81-30935# Danish Meteorological Inst., Copenhagen. Geophysics Section 2.
ENERGY LOSS OF PROTONS IN MOLECULAR OXYGEN
Vir Singh 1980 9 p refs Submitted for publication Sponsored by DANIDA
(DMI-Geophys-Papers-R-64; ISBN-87-7478-182-0) Avail: NTIS HC A02/MF A01

The proton loss function (important in the study of secondary electron spectrum and optical emissions in the earth's upper atmosphere) in molecular oxygen was studied using appropriate elastic and inelastic cross sections. Earlier results for the loss function were modified for ionization, charge exchange and elastic scattering. The main effects of new ionization and stripping techniques are seen between 4keV and 400keV. At high impact energy, above 400keV, the modified results are close to earlier results because they give similar cross sections. Below 4keV, the difference is due to the elastic process. Theoretical results are presented and are in good agreement with experimental results. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N81-30936# California Univ., Berkeley.
DESIGN OF FOCUSSING AND GUIDE STRUCTURES FOR CHARGED PARTICLES BEAMS USING RARE EARTH-COBALT PERMANENT MAGNETS
K. Halbach Jun. 1981 10 p refs Presented at the 5th Intern. Workshop on Rare Earth-Cobalt Magnets and Their Appl., Roanoke, Va., 7-10 Jun. 1981 Submitted for publication
(Contract W-7405-eng-48)
(LBL-12552; Paper-2-1; CONF-810644-1) Avail: NTIS HC A02/MF A01

A number of different methods were used to describe the magnetic properties of oriented rare earth cobalt (REC) material. It is shown how these different methods of description lead to different ways to think about, and to execute, the design of magnets that are useful for focusing and guiding charged particle beams. It is also be demonstrated that in some of these magnets, the REC material is used in a somewhat unusual way, requiring magnetics properties of the material that are usually not considered to be of great practical importance. DOE

N81-30937# Yale Univ., New Haven, Conn. Dept. of Physics.
INTERNAL SPIN STRUCTURE OF THE PROTON FROM HIGH ENERGY
V. W. Hughes, G. Baum, M. R. Bergstroem, P. R. Bolton, J. E. Clendening, N. R. DeBotton, S. K. Dhawan, R. A. Fong-Tom, Y.-N. Guo, and V.-R. Harsh Feb. 1981 14 p refs Presented at the Intern. Symp. on High Energy Phys. with Polarized Beams and Polarized Targets, Lausanne, Switzerland, 25 Sep. - 1 Oct. 1980
(Contracts DE-AC03-76SF-00515; DE-AC02-76ER-03075)
(SLAC-PUB-2674) Avail: NTIS HC A02/MF A01

A review is given of experimental knowledge of the spin dependent structure functions of the proton, which is based on inclusive high energy scattering of longitudinal polarized electrons by longitudinally polarized protons in both the deep inelastic and resonance regions. Implications for scaling, sum rules, models of proton structure, and the hyperfine structure interval in hydrogen are included. DOE

N81-30938# Stanford Linear Accelerator Center, Calif.
SOME SCHEMES FOR ON-LINE CORRECTION OF THE CLOSED ORBIT, DISPERSION AND BETA FUNCTIONS IN PEP
M. H. R. Donald (California Univ., Berkeley. Lawrence Berkeley Lab.), C. Blocker (Harvard Univ.), A. W. Chao, R. J. Hellebeek, M. J. Lee, J. E. Linstadt, J. L. Siegrist, and N. Spencer Feb. 1981 3 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contracts DE-AC03-76SF-00515; W-7405-eng-48; DE-AC02-76ER-03064)
(SLAC-PUB-2666; CONF-810314-154; PEP-Note-352) Avail: NTIS HC A02/MF A01

The PEP was operated successfully under computer control. It is necessary for colliding beam operation that the errors in closed orbits, dispersion and beta functions be corrected. The schemes in the PEP control program for on-line correction of these errors are described. The orbit control tasks in the PEP control system perform the functions of data gathering, data presentation (color display, printing), calculation and setting of corrector magnets. The tasks are generally small and modular, taking information from the database, processing it, then returning the results to the database. The PEP operator communicates with the tasks through touch panels monitored by the direct program. The display task, which displays orbit and corrector information on a TV color display provides the main information required by the operator. DOE

N81-30939# Stanford Linear Accelerator Center, Calif.
OPERATION OF THE PEP TRANSVERSE BEAM FEEDBACK
C. W. Olson, J. M. Paterson, J. L. Pellegrin, and J. R. Rees Feb. 1981 3 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-PUB-2690; CONF-810314-153; PEP-NOTE-348) Avail: NTIS HC A02/MF A01

The PEP storage ring was equipped with a wide band beam feedback system capable of damping the vertical and horizontal motion of six bunches. The oscillation detection is done at a

symmetry point on the storage ring and feedback is applied at the same location one orbital period later. The signal is synchronously gated and the system appears as twelve independent feedback loops, operating on the two coordinates of each of the six bunches. Two beam deflection electrodes are driven each by a low Q push-pull amplifier which is tuned at the 72nd harmonic of the revolution frequency and suppressed carrier modulation is generated by a sequence of the detected bunch oscillations. The design parameters are reviewed as well as the machine operation is evaluated in the light of experimental results. DOE

N81-30940# Stanford Linear Accelerator Center, Calif.
OPTICAL BEAM DIAGNOSTICS ON PEP
A. P. Sabersky Feb. 1981 3 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-Pub-2683; CONF-810314-145; PEP-NOTE-349) Avail: NTIS HC A02/MF A01

In designing the PEP optical diagnostics we were able to build on the experience gained with SPEAR. Most of the problems at SPEAR could be traced to the optical diagnostic system being inside the tunnel. A machine shutdown is required for any maintenance or modification. This implies that in order to make such an instrument successful, a large engineering effort must be mounted to ensure 100 percent operation at startup. The functions that do not work at startup may never be made to work; this has happened at several machines. Experimental setups are likewise risky and time consuming. A point borne out in both SPEAR and PEP is that the mechanical part of the instrument, the special vacuum chamber, the optical mounts, the alignment and adjustments, require approximately 60 percent of the effort and cost of the optical diagnostics. It is far better to economize on detectors and electronics than on mechanical and optical essentials. DOE

N81-30941# Stanford Linear Accelerator Center, Calif.
RADIATION AND ELECTRICAL SAFETY SYSTEMS FOR PEP
H. Smith, T. Constant, K. Crook, J. Fitch, and T. Taylor Feb. 1981 3 p ref Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-PUB-2675; CONF-810314-157) Avail: NTIS HC A02/MF A01

At SLAC, the Personnel Protection System (PPS) protects people from radiation hazards. For PEP, the system was expanded to include protection against electrical and RF hazards. The overall system design is described, giving particular attention to the novel features not found in similar systems in other areas of SLAC. These include the Restricted Access Mode to allow limited occupancy in the ring while high voltage or RF may be present, the automatic badge reader system for improving the efficiency of entry logging and control, and the solid state lighting control system for switching large lighting loads with minimum electromagnetic interference. DOE

N81-30942# Stanford Linear Accelerator Center, Calif.
PROSPECTS FOR VERY-HIGH-GRADIENT LINAC-COLLIDERS
P. B. Wilson Feb. 1981 7 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-Pub-2689; CONF-810314-138) Avail: NTIS HC A02/MF A01

The energy realistically attainable by an electron-positron storage ring is limited by the RF voltage and power requirements imposed by synchrotron radiation to about 100 GeV. To reach energies of 300 x 300 GeV and higher in a colliding beam machine of reasonable dimensions, we must look to the final collider operating at an energy gradient on the order of 100 MV/m. Proper choice of an RF structure or such a collider can minimize the total RF power requirement and the effects of longitudinal and transverse single bunch beam loading. Possibilities for attaining peak power levels by direct generation and by energy storage and fast switching are discussed. DOE

N81-30943# Stanford Linear Accelerator Center, Calif.
PEP STORAGE RING: CURRENT STATUS
J. R. Rees Feb. 1981 5 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-Pub-2684; CONF-810314-146; PEP-NOTE-347) Avail: NTIS HC A02/MF A01

Comments on the performane of the subsystems of PEP are given. The beam dynamical behavior of the machine is discussed and it is compared with our expectations. Finally, plans for improving PEP are described. DOE

N81-30944# Stanford Linear Accelerator Center, Calif.
NEW GENERATION CONTROL SYSTEM AT SLAC
R. Melen Mar. 1981 5 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-PUB-2704; CONF-810314-150) Avail: NTIS HC A02/MF A01

An instrumentation and control system that provides integrated automatic monitoring and control functions for the SLAC Linear Collider is described. The computer hardware and software architectures are discussed. DOE

N81-30945# Los Alamos Scientific Lab., N. Mex.
LOW-LEVEL-WASTE-DISPOSAL METHODOLOGIES
Merlin L. Wheeler and Kitty Dragonette (Nuclear Regulatory Comm., Washington, D.C.) 1981 13 p refs Presented at Am. Nucl. Soc. Ann. Meeting, Miami Beach, Fla., 7-12 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1385; CONF-810606-36) Avail: NTIS HC A02/MF A01

This report covers the following: (1) history of low level waste disposal; (2) current practice at the five major DOE burial sites and six commercial sites with dominant features of these sites and radionuclide content of major waste types summarized in tables; (3) site performance with performance record on burial sites tabulated; and (4) proposed solutions. Shallow burial of low level waste is a continuously evolving practice and each site has developed its own solutions to the handling and disposal of unusual waste forms. There are no existing national standards for such disposal. However, improvements in the methodology for low level waste disposal are occurring on several fronts. Standardized criteria are being developed by both the Nuclear Regulatory Commission (NRC) and by DOE. Improved techniques for shallow burial are evolving at both commercial and DOE facilities, as well as through research sponsored by NRC, DOE, and the Environmental Protection Agency. DOE

N81-30946# Brookhaven National Lab., Upton, N. Y.
LASER-DRIVEN ELECTRON ACCELERATORS
Robert B. Palmer 1981 6 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29329; CONF-810314-110) Avail: NTIS HC A02/MF A01

Inverse free electron lasers (the wiggler accelerator), the inverse Cerenkov effect, plasma accelerators, the dielectric tube, and grating linear accelerators are evaluated as possible drives for linear electron accelerators. An order of magnitude comparison of power outputs is presented. The grating accelerator is determined to be the better alternative. DOE

N81-30947# Brookhaven National Lab., Upton, N. Y.
LONGITUDINAL INSTABILITIES IN CIRCULAR ACCELERATOR AND STORAGE RINGS
C. Pellegrini 1981 7 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11 Mar. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29302; CONF-810314-109) Avail: NTIS HC A02/MF A01

The longitudinal coherent instability of bunched beam is considered. Although there is no general solution it is possible to identify regions in the frequency-risetime space where approximate solutions are obtained. The collective oscillation frequency is written, and expressions for the effective coupling

impedance are given for the high or low frequency and slow and fast blow-up regimes. DOE

N81-30948# Los Alamos Scientific Lab., N. Mex.
MULTIGIGAHERTZ BEAM DIAGNOSTICS FOR LASER FUSION
R. C. Smith, E. K. Hodson, and R. L. Carlson 1981 8 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1282; CONF-810429-7) Avail: NTIS HC A02/MF A01

A system to make ultra wideband measurements of fast laser pulses and their induced target interactions at a distance of approximately 38 m from the target location is discussed. The system has demonstrated an overall bandwidth of GHz with projected unfolding to 4 GHz. This system allows high resolution temporal history diagnostics in a remote location providing high EMI and radiation immunity. DOE

N81-30949# Battelle Pacific Northwest Labs., Richland, Wash.
USE OF GEOHYDROLOGIC RESPONSE FUNCTIONS IN THE ASSESSMENT OF DEEP NUCLEAR WASTE REPOSITORIES: ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS
R. W. Nelson May 1981 53 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3817) Avail: NTIS HC A04/MF a01

Key geohydrologic effects are summarized that are important in site selection and repository evaluation. These effects efficiency interrelate three vital factors needed in the repository decision making process, i.e., the quantity, arrival time, and location of contamination reaching the biosphere. Further focus is given to two related and effectively additive parameters: the initial delay time; and the delay spread time. R.C.T.

N81-30950# Los Alamos Scientific Lab., N. Mex. Space and Terrestrial Systems Div.
SPACE NUCLEAR SAFETY AND FUELS PROGRAM Progress Report
S. E. Bronisz, comp. May 1981 29 p
(Contract W-7405-eng-36)
(LA-8865-PR) Avail: NTIS HC A03/MF A01

Studies related to the use of (238) PuO2 in radioisotopic power systems carried out for the Space and Terrestrial Systems Division of the US Department of Energy are described. DOE

N81-30951# Mound Lab., Miamisburg, Ohio.
GAMMA-RAY MEASUREMENTS FOR SIMULTANEOUS CALORIMETRIC ASSAY
David A. Rakel 1981 6 p refs
(Contract DE-AC04-76DP-00053)
(MLM-2840(OP)) Avail: NTIS HC A02/MF A01

By combining the measurements obtained by calorimetry and gamma ray spectroscopy, calorimetric assay provides a nondestructive method for determining the plutonium content of a sample. Simultaneous calorimetric assay refers to a system in which both of these measurements are performed at the same time. This paper reports the results of gamma ray measurements performed in developing the simultaneous calorimetric assay system. The transmission of gamma rays through the calorimeter was measured over the energy region germane to a determination of plutonium isotopic composition. For six different samples, a gamma ray measurement of isotopic composition was obtained with the sample in the calorimeter. The items represented a range of plutonium content (19-231 g) and isotopic composition. The effective specific power was calculated from the isotopic composition determined by gamma ray measurements. The uncertainty in the effective specific power indicates, for the items measured in this study, and as measured in this study, the uncertainty in the total plutonium content of the sample expected in simultaneous calorimetric assay. GRA

N81-30952# Brookhaven National Lab., Upton, N. Y. Physics Dept.
HIGHLIGHTS OF HIGH ENERGY PP, ANTI PP AND POSITRON ELECTRON INTERACTIONS
L. C. Wang 1981 40 p refs Presented at the Cornell Z/Sup 0/Physics Workshop, Ithica, N.Y., 6-8 Feb. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29465; CONF-810246-3) Avail: NTIS HC A03/MF A01

Topics covered include the production cross sections of Wt (+ or -) and Z (zero) the detection of the Z (zero) and W (+ or -) some detailed features of the Drell-Yan model; the onia production and the Higgs boson and technicolor pseudo scalar production. The e(+)e(-) interactions are compared with the pp and p anti p interactions. DOE

N81-30953# Los Alamos Scientific Lab., N. Mex.
MULTI-ENERGY GAMMA-RAY AUTOMATED SCANNING SYSTEM
Hsiao-Hua Hsu, John C. Pratt, and Edward R. Shunk 1981 14 p ref Presented at the 5th Symp. on X- and Gamma-Ray Sources and Appl., Ann Arbor, Mich., 10-12 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1511; CONF-810647-2) Avail: NTIS HC A02/MF A01

A CAMAC-based gamma-ray scanning system was used to measure the transmission through stacked attenuators for up to 16 different gamma rays. For each measurement, we obtained the transmission for gamma rays ranging in energy from 77 to 2614 keV. These transmission measurements were used to produce a set of linear equations that may be solved for either thickness or density of the discrete attenuators comprising a given stacked assembly. DOE

N81-30954# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
USE OF A SMALL OFF-LINE COMPUTER IN THE OPERATION OF A VERSATILE HEAVY ION CYCLOTRON
R. A. Gough Mar. 1981 6 p refs Presented at IEEE 1981 Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract W-7405-eng-48)
(LBL-11709) Avail: NTIS HC A02/MF A01

An interactive computer program for providing parameter information about cyclotron operation is described. The program is written in BASIC on a small off-line computer to perform a variety of calculations for any ion species and energy. The program can provide the operator with cyclotron and beam line settings for any beam, regardless of whether or not the beam has been previously run, by utilizing the broad data base acquired over a decade of heavy ion operation. Additional calculations now being performed conveniently and routinely by the operations staff are discussed. DOE

N81-30955# Argonne National Lab., Ill.
NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STUDY: WASTE DISPOSAL TECHNICAL REPORT
J. L. S. Saguinsin Apr. 1981 243 p refs
(Contract W-31-109-eng-38)
(DOE/RG-0058) Avail: NTIS HC A11/MF A01

The potential for cumulative and interactive environmental impacts associated with the conversion of multiple generating stations in the Northeast is assessed. The estimated quantities and composition of wastes resulting from coal conversion, including ash and SO2 scrubber sludge, are presented. Regulations governing the use of ash and scrubber sludge are identified. Currently available waste disposal schemes are described. The location, capacity, and projected life of present and potential disposal sites in the region are identified. Waste disposal problems, both hazardous and nonhazardous, are evaluated. Environmental regulations within the region as they pertain to coal conversion and as they affect the choice of conversion alternatives are discussed. A regional waste management strategy for solid waste disposal is developed. DOE

N81-30956# Ford, Bacon and Davis Utah, Inc., Salt Lake City.
CRITERIA FOR GREATER CONFINEMENT OF RADIOACTIVE WASTES AT ARID WESTERN SITES
Darrel H. Card, Preston H. Hunter, John H. Adam, and Richard B. White May 1981 135 p refs Prepared for Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho
(DOE/ID-01570/T20; NVO-234) Avail: NTIS HC A07/MF A01

Criteria and standards are discussed relative to seven major

areas: radiation exposure protection; characterization of waste; transportation and handling; site selection; engineering; general facility requirements; and administration. Objectives or goals of burial at intermediate depths to provide greater confinement, and its advantages and disadvantages compared to shallow land burial, are discussed. A generic greater confinement disposal facility (GCDF) is described, and the various interrelating factors which must be considered in the selection of a viable site and in the development of GCDF design and performance criteria are analyzed. DOE

N81-30957# Los Alamos Scientific Lab., N. Mex.
HAZARDOUS AND RADIOACTIVE WASTE INCINERATION STUDIES
J. S. Vavruska, L. A. Stretz, and L. C. Borduin 1981 34 p refs Presented at ASME/USEPA Hazardous Waste Incineration Conf., Williamsburg, Va., 27-28 May 1981
(LA-UR-81-1170; CONF-810551-2) Avail: NTIS HC A03/MF A01

Development and demonstration of a transuranic (TRU) waste volume-reduction process is described. A production-scale controlled air incinerator using commercially available equipment and technology was modified for solid radioactive waste service. This unit successfully demonstrated the volume reduction of transuranic (TRU) waste with an average TRU content of about 20 nCi/g. The same incinerator and offgas treatment system is being modified further to evaluate the destruction of hazardous liquid wastes such as polychlorinated biphenyls (PCBs) and hazardous solid wastes such as pentachlorophenol (PCP)-treated wood. DOE

N81-30958# Brookhaven National Lab., Upton, N. Y.
MICROPROCESSOR-BASED SINGLE BOARD COMPUTER FOR HIGH ENERGY PHYSICS EVENT PATTERN RECOGNITION
H. Bernstein, J. J. Gould, R. Imossi, J. K. Kopp, W. A. Love, S. Ozaki, E. D. Platner, and M. A. Kramer (City Coll. of the City Univ. of New York) 1981 10 p Presented at the Conf. on the Appl. of Microprocessors to High Energy Physics Experiments, Geneva, 4 May 1981 Sponsored in part by NSF
(Contract DE-AC02-76CH-00016)
(BNL-29509; CONF-810539-3) Avail: NTIS HC A02/MF A01

A single board MC 68000 based computer was assembled and bench marked against the CDC 7600 running portions of the pattern recognition code used at the MPS. This computer has a floating coprocessor to achieve throughout equivalent to several percent that of the 7600. A FORTRAN compiler including assembler, linker and library are described. DOE

N81-30959*# Los Alamos Scientific Lab., N. Mex.
VACUUM ULTRAVIOLET LIGHT PRODUCTION BY NUCLEAR IRRADIATION OF LIQUID AND GASEOUS XENON
G. C. Baldwin May 1981 12 p refs Sponsored in part by NASA
(Contract W-7405-eng-36)
(NASA-CR-164563; LA-8786) Avail: NTIS HC A02/MF A01 CSCL 20E

Recent Los Alamos investigations suggest that a liquefied noble element may be the long-sought medium for a nuclear-excited laser or flashlamp. Research is needed to confirm this finding and to provide a basis for design and application studies. Quantitative and qualitative information are needed on the nature and behavior of the excited species, the effects of impurities and additives in the liquid phase under nuclear excitation, and the existence and magnitudes of nonlinear effects. Questions that need to be addressed and the most appropriate types of facilities for this task are identified. DOE

74 OPTICS

Includes light phenomena.

N81-30960 Florida Univ., Gainesville.
SURFACE REFLECTANCE MEASUREMENTS IN THE ULTRAVIOLET FROM AN AIRBORNE PLATFORM Ph.D. Thesis
David Dante Doda 1980 223 p
Avail: Univ. Microfilms Order No. 8115628

The reflectance of naturally occurring surfaces is measured from a twin engine Cessna 402 series aircraft both spectrally (0.29 to 0.40 microns) and broadband (0.29 to 1.2 microns). The measurement system, which is computer controlled and electrically isolated from the aircraft, consists of upward and downward sensing hemispheric diffusers, baffles, filters, a rotating 90 deg mirror, a focusing lens, and a double monochromator/PMT or an ultraviolet photodiode. Measurements are reported for several altitudes above each surface enabling the empirical determination of the backscatter and attenuation effects on the reflectance. The results are presented for a pine forest (2.85 to 5.24%), the open ocean (7.14 to 10.88%), green farmland (3.72 to 4.71%), brown farmland (2.63 to 4.49%), desert sand (5.47 to 8.26%), black lava (4.56 to 6.14%) gypsum sand (18.32 to 60.08%), and a snow cover (26.49 to 42.89%). In addition, the spectral reflectance results are analytically characterized by a three parameter form. This representation agrees quite well with these measured reflectance results and fits previously published results equally well. Dissert. Abstr.

N81-30961 Maryland Univ., College Park.
EXPERIMENTAL VERIFICATION OF LIGHT SCATTERING THEORY Ph.D. Thesis
Niall Bernard McNelis 1980 83 p
Avail: Univ. Microfilms Order No. 8117348

The corrected formula for the collision dominated theory of light scattering is given. The validity of these corrections is verified by comparison with previous experiments. This same formulation is used to derive three functions of the scattering parameter alpha: the electron to ion integrated feature ratio, the electron to ion intensity ratio, and the ratio of the actual electron satellite frequency to the electron plasma frequency. A range of scattering spectra ($1 < \text{alpha} < 2$) was collected and the derived ratios were the theoretical ratios. Two different methods for determining density and temperature from the scattering spectra are discussed. The first relies on a Rayleigh scattering calibration. The second uses the fitted value of alpha and the electron peak location. Both methods are compared to a density derived independently from Stark broadening and to a temperature derived independently from the ratio of successive ionization stages of carbon. The Rayleigh method yielded results within 16% of the independent results, while the second method wave results within 12%. Dissert. Abstr.

N81-30962*# Hughes Research Labs., Malibu, Calif.
DEFINITION, ANALYSIS AND DEVELOPMENT OF AN OPTICAL DATA DISTRIBUTION NETWORK FOR INTEGRATED AVIONICS AND CONTROL SYSTEMS Final Report, Jun. 1979 - May 1980
Ronnie R. Burns Aug. 1981 152 p refs
(Contract NAS1-15829)
(NASA-CR-159370) Avail: NTIS HC A08/MF A01 CSCL 20F

The potential and functional requirements of fiber optic bus designs for next generation aircraft are assessed. State-of-the-art component evaluations and projections were used in the system study. Complex networks were decomposed into dedicated structures, star buses, and serial buses for detailed analysis. Comparisons of dedicated links, star buses, and serial buses with and without full duplex operation and with considerations for terminal to terminal communication requirements were obtained. This baseline was then used to consider potential extensions of busing methods to include wavelength multiplexing and optical switches. Example buses were illustrated for various areas of the aircraft as potential starting points for more detail analysis as the platform becomes definitized. M.G.

N81-30963*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
OPTICAL PROCESSING FOR LANDMARK IDENTIFICATION Final Report
David Casasent and Thanh Ky Luu Sep. 1981 73 p refs
(Contract NAS1-16125)
(NASA-CR-165757) Avail: NTIS HC A04/MF A01 CSCL 20F

A study of optical pattern recognition techniques, available components and airborne optical systems for use in landmark identification was conducted. A data base of imagery exhibiting multisensor, seasonal, snow and fog cover, exposure, and other differences was assembled. These were successfully processed in a scaling optical correlator using weighted matched spatial filter synthesis. Distinctive data classes were defined and a description of the data (with considerable input information and content information) emerged from this study. It has considerable merit with regard to the preprocessing needed and the image difference categories advanced. A optical pattern recognition airborne applications was developed, assembled and demontrated. It employed a laser diode light source and holographic optical elements in a new lensless matched spatial filter architecture with greatly reduced size and weight, as well as component positioning toleranced. R.C.T.

N81-30964* Science Applications, Inc., Huntsville, Ala.
DESIGN, FABRICATION AND TEST OF LAST CUT FOLLOWER Final Report
Paul R. Ashley and Peter D. Poulsen Jun. 1981 11 p refs
(Contract NAS8-33700)
(NASA-CR-161835; SAI-82-640-HU) Avail: NTIS HC A02/MF A01 CSCL 20F

An optical device for following the cut in mining operations is described, and the results of acceptance testing reported. A measuring accuracy of + or - 1/16 inch was demonstrated. Preliminary results on longwall testing with the device mounted on a shearer are presented. Roof profiles measured during tramming and during cutting are presented. Comparison of acoustic measurements with optical measurement of the roof profiles indicates close agreement. J.D.H

N81-30965# Avco-Everett Research Lab., Mass.
HIGH INTENSITY PULSED PLASMA X-RAY SOURCE Interim Report, 30 Sep. - 31 Dec. 1980
A. Ballantyne, H. Friedman, and H. Hyman Hanscom AFB, Mass. RADC Apr. 1981 29 p
(Contract F19628-80-C-0176; AF Proj. 2700)
(AD-A101429; RADC-TR-81-51) Avail: NTIS HC A03/MF A01 CSCL 14/5

The objective of the program is to perform a design study for a laser-driven, high-intensity pulsed plasma source for X-ray lithography, including a consideration of the effects of such a source on the X-ray mask structures. During this initial quarterly period, work has begun on the design for the CO2 laser driver, as well as on an analysis of the constraints imposed upon the pulsed X-ray source parameters due to thermally-induced stress damage to the mask. The complete design for the CO2 laser system must include several subsystems, the most important being the power amplifier module (PAM). During this reporting period, the conceptual design and operating parameters for the PAM have been developed, and tradeoff studies at the interfaces of support systems have been outlined. Also during this period, a scoping analysis has been performed to examine some of the influences of both x-ray source and mask geometry upon mask thermal stress constraints. Using an analytical model, parametric variation with respect to mask substrate thickness, X-ray wavelength, and X-ray pulselength has been carried out. In addition, some effects of mask configuration have been investigated. These preliminary studies ars intended to give an insight into the phenomenology involved in the interaction between intense pulsed X-ray sources and potential mask damage mechanisms. GRA

N81-30966# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
ELECTROMAGNETIC INTERFERENCE SUSCEPTIBILITY OF AIRBORNE FIBER OPTICS SYSTEMS Phase Report, Oct. 1979 - Sep. 1980
John P. Uyemura May 1981 96 p refs
(Contract F30602-78-C-0120; AF Proj. 2338)
(AD-A101727; RADC-TR-81-62) Avail: NTIS HC A05/MF A01 CSCL 20/6

The EMI problems associated with an airborne fiber optic communication system are examined. Interest is directed towards identifying possible noise sources and coupling channels which may exist. It is found that fiber optics transmission links can exhibit high degress of immunity to stray EMI so long as certain precautions are taken in the original system design. Qualitative guidelines for decreasing the EMI susceptibility are given. Particular problem points are also discussed. Author (GRA)

N81-30967# Los Alamos Scientific Lab., N. Mex.
ULTRAVIOLET-SPECTROGRAPH LENS
B. Brixner and M. A. Winkler 1981 10 p refs Presented at Conf. on Optics, Santa Fe, 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1074; CONF-810429-10) Avail: NTIS HC A02/MF A01

A 700-mm f/4.7 spectrograph camera lens was designed for imaging spectral lines in the 200 to 400 nm region on a 120-mm flat image field. Lens elements of fused silica and crystal calcium fluoride give such good achromatization that raytracing calculations predict a resolution limit of 30 lines/mm without refocusing in the 283 to 365-nm region. Light scattering at the polished calcium-fluoride surfaces is avoided by sandwiching the fluoride elements between fused silica and cementing with silicone fluid. The constructed lens makes good spectrograms. DOE

N81-30968# California Univ., Livermore. Lawrence Livermore Lab.
ANGULAR MEASUREMENTS IN OPTICAL TESTING
Norman L. Thomas 25 Sep. 1980 7 p Presented at the Spring Conf. on Applied Optics, Oakland, Calif., 31 May - 6 Jun. 1980
(Contract W-7405-eng-48)
(UCRL-84968; CONF-800569-2) Avail: NTIS HC A02/MF A01

Some angle measurement techniques and how they are used in optical testing are reviewed. Interferometers, protractors, lasers, autocollimators, sine bars, goniometers and others are discussed.

N81-30969# Centre National d'Etudes Spatiales, Toulouse (France). Div. Stabilisation Structures Thermique.
DEFINITION OF THE MAROTS REFLECTOR MERIDIAN LINE BY INTERPOLATION: APPLICATION TO OPTICAL MEASUREMENTS
M. Bouthier 20 Apr. 1978 21 p In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-696)
(CNES-78/CT/PRT/SST/SM/05) Avail: NTIS HC A02/MF A01

The positioning of the optics, as part of laboratory tests on the MAROTS reflector in order to measure thermoelastic deflections while simulating typical orbital temperature distributions, is described. The experiment revolves around a theodolite located at the axis of the reflector; small mirrors are attached to the reflector. Consequently, positioning depends on the reflector surface being known with sufficient accuracy. As the meridian line is initially defined by 40 points, interpolation of measurement data provides accurate coordinates and slopes at any point. Interpolation by adequate spline functions is shown to give satisfactory results, making it possible to optimize the location of the theodolite and the mirrors for the deflection measurements. Author (ESA)

N81-30970# Oxford Univ. (England). Dept. of Engineering Science.
CONTRAST CONTROL IN THE SCANNING OPTICAL MICROSCOPE
D. K. Hamilton Oct. 1980 5 p
(OUEL-1337/80) Avail: NTIS HC A02/MF A01

Problems of contrast control in the scanning optical microscope are compared with a conventional television system. Because a small fraction of the signal anywhere in the range is amplified to fill the full black-white range of the display, independent control of display brightness and contrast is desirable. To achieve this, the contrast (gain) control should be performed earlier in the system than the brightness (d.c. level) control. A system of contrast enhancement which adds a d.c. offset to the signal and then varies the gain about zero volts in the video amplifier is described, which achieves independent control if the feature to be observed is black. Possible improvements to make

the gain control vary the signal level relative to mid-gray in the display are postulated. Author (ESA)

N81-30971# National Physical Lab., Teddington (England). Div. of Electrical Science.
THE OPTICAL CONSTANTS OF SOME COMMON LOW LOSS POLYMERS BETWEEN 4 AND 40 CM
J. R. Birch, J. D. Dromey (Queen Mary Coll., London), and J. Lesurf Feb. 1981 30 p refs
(NPL-DES-69; ISSN-0143-7305) Avail: NTIS HC A03/MF A01

The optical constants of low and high density polyethylene, polyamide, polymethyl methacrylate, polytetrafluoroethylene, polystyrene and poly 4 methyl pentene-1 were determined at a temperature of 290 K in the spectral region between 4 and 40 cm by dispersive Fourier transform spectrometry. Graphs and tabulations of refractive index, absorption coefficient, real and imaginary parts of the complex relative the complex relative permittivity and loss tangent are presented. An indication of the extent to which the optical constants can differ between specimens of the same material is given. Author (ESA)

N81-31094*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP-SPACE OPTICAL CHANNEL. 1: NOISE MECHANISMS
J. Katz *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 180-186 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N81-30972 Wisconsin Univ. - Madison.
LOW-FREQUENCY COHERENT FLUCTUATIONS IN THE PROTO-CLEO TORSATRON Ph.D. Thesis
Jeffrey Hunter Harris 1981 166 p
Avail: Univ. Microfilms Order No. 8111458

Digital signal processing techniques were used to study low frequency (f < 100 kHz) fluctuations in the ohmically-heated plasma of the Proto-Cleo torsatron. Density fluctuations measured using single Langmuir probes have helical symmetry with poloidal and toroidal mode numbers (m,n) such that q = m/n 3 to 5, which approximately matches the helicity of the vacuum magnetic field. The poloidal mode numbers range from m = 4 at 20 kHZ to m = 16 at 100 kHz, while the toroidal mode numbers range from 1 to 4 over the same frequency range. The m = 4, n = 1 mode is the largest, and the fluctuation amplitude decreases approximately linearly with frequency. The density fluctuations peak on the steepest gradients of current and plasma density and rotate poloidally with a velocity consistent with E x B and/or ion diamagnetic drifts. The causes of these fluctuations appears to be a resistive MHD instability. Calculations of growth rates indicate that the resistivity gradient driven 'rippling mode' is the instability most likely to be responsible for the fluctuations. Dissert. Abstr.

N81-30973*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A PROGRAM-MANAGEMENT PLAN WITH CRITICAL-PATH DEFINITION FOR COMBUSTION AUGMENTATION WITH THERMIONIC ENERGY CONVERSION (CATEC)
James F. Morris, Owen S. Merrill (DOE, Washington, D.C.), and Harsha K. Reddy (The Aerospace Corp., Los Angeles) 1981 50 p refs Presented at Intern. Conf. on Plasma Sci., Santa Fe, N. Mex., 18-20 May 1981
(Contract EC-77-A-31-1062)
(NASA-TM-82670; E-950; DOE/NASA/1062-0) Avail: NTIS HC A03/MF A01 CSCL 20I

Thermionic energy conversion (TEC) is discussed. In recent TEC-topping analyses, overall plant efficiency (OPE) and cost of electricity (COE) improved slightly with current capabilities and substantially with fully matured technologies. Enhanced credibility derives from proven hot-corrosion protection for TEC by silicon-carbide clads in fossil fuel combustion products. Combustion augmentation with TEC (CATEC) affords minimal cost and plant perturbation, but with smaller OPE and COE improvements than more conventional topping applications. Risk minimization as well as comparative simplicity and convenience, favor CATEC for early market penetration. A program-management plan is proposed. Inputs, characteristics, outputs and capabilities are discussed. S.F.

N81-30974# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CONFINEMENT, ADDITIONAL HEATING (NBI, LHH, ECH) AND CURRENT DRIVE OF STELLARATOR PLASMA IN JIPP T-2
J. Fujita, S. Itoh (Kyushu Univ.), K. Kadota, O. Kaneko, K. Kawahata, Y. Kawasumi, T. Kuroda, K. Matsuoka, K. Matsuura, K. Miyamoto (Tokyo Univ., Japan) et al Jun. 1981 35 p refs
(IPPJ-520) Avail: NTIS HC A03/MF A01

The confinement of ohmically heated stellarator plasma is studied experimentally. The energy confinement time tau sub E increases with total rotational transform angle L sub sigma in the case of L sub sigma/2 pi < 0.25, while tau sub E decreases with L sub sigma for L sub sigma/2 pi > 0.3 which is consistent with the Alcator scaling. Tangential injections of neutral beams are carried out for additional heating of stellarator and Tokamak plasmas. With co-injection, the increase in ion temperature at the center per injected power into the torus is 1.6 eV/kW in the stallarator and 1.9 eV/kW in the Tokamak configuration. Lower hybrid heating with the frequency of 0.8 GHz is applied. In both cases of stellarator and Tokamak, ion heating of 0.8 eV/kW is observed with input power up to 160 to 180 kW. Electron cyclotron heating by use of klystrons with frequency of 35.5 GHz is carried out. Preliminary results show heating of bulk electrons ith the heating efficiency of 1.6 eV/kW. Current drive in stellarator plasma by lower hybrid wave is observed in the case of low density plasma. M.G.

N81-30975# Nagoya Univ. (Japan). Inst. of Plasma Physics.
A SLOW WAVES HEATING EXPERIMENT ON RFC-XX
T. Watari, K. Adati, T. Aoki, S. Hidekuma, K. Hattori, S. Hiroe, M. Ichimura, T. Kawamoto, R. Kumazawa, Y. Okubo et al May 1981 39 p refs
(IPPJ-519) Avail: NTIS HC A03/MF A01

Experimental data for ion cyclotron resonance heating in the RFC-XX machine are presented. The achieved ion temperature is as high as 100 eV at n = 10 to the 13th power cm(-3) and 1 keV at 10 to the 12th power cm(-3). A simple model of the multiple antenna problem is also given and used to interpret experimental data. M.G.

N81-30976# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ABLATION ACCELERATION OF MACROPARTICLE IN SPIRAL MAGNETIC FIELDS
Kazunari Ikuta May 1981 15 p refs
(IPPJ-518) Avail: NTIS HC A02/MF A01

The ablation acceleration of a macroparticle in a spiral magnetic field is investigated with the help of the law of conservation of angular momentum. The basic equation of motion is discussed. An effect of a spiral magnetic field on macroparticle acceleration is demonstrated. It is concluded that the accelerated body can be given a spin without loss of translational acceleration. J.D.H.

N81-30977# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
INJECTION OF INTENSE PULSED-ION BEAMS INTO TOKAMAKS WITH APPLICATIONS TO PLASMA HEATING AND CURRENT MAINTENANCE Interim Report
Wallace M. Manheimer and Niels K. Winsor 24 Jun. 1981 20 p refs
(AD-A101193; NRL-8482) Avail: NTIS HC A02/MF A01 CSCL 18/1

This report examines various schemes by which an intense pulsed ion beam can be injected into a Tokamak. There are several schemes which appear to be viable just as the plasma is being formed, but which cannot work for a steady state plasma. All schemes considered here use parallel injection. Once the

beam is in the plasma, the heating and current maintenance are calculated. It is found that intense pulsed beams with reasonable energy should be capable of heating the plasma to breakeven and ignition. Author (GRA)

N81-30978# Illinois Univ., Urbana. Fusion Studies Lab.
FINITE-ORBIT METHOD FOR DYNAMIC ANALYSIS OF MIRROR FUSION SYSTEMS
M. M. Campbell and G. H. Miley 1981 20 p Presented at the ANS/ENS Joint Topical Meeting on Math. Methods in Nucl. Eng., Munich, 27 Apr. 1981
(Contract DE-AS02-76ET-52040)
(CONF-810415-5) Avail: NTIS HC A02/MF A01

A model (FOREMD) is described which treats plasma buildup in small mirror fusion devices where finite gyroradius effects are important to the dynamic evolution of the density an energy profiles. An energy dependent group technique is employed, but unlike conventional point kinetic diffusion models, the local density is calculated by a summing over orbits passing through th volume of interest. This treatment is particularly important during buildup via neutral beam injection where charge exchange losses near the surface affect the inner volume density distribution through loss of large orbit ions. As an example of the use of FOREMD, buildup processes in two experimental devices (2X-IIB and TMX) are examined. DOE

N81-30979# General Atomic Co., San Diego, Calif.
OPTICAL THERMOGRAPHY FOR A FUSION TOKAMAK NEUTRAL-BEAM INJECTION SYSTEM
T. McHahon, J. Kamperschroer, F. Levine, and T. Colleraine Nov. 1980 10 p refs Presented at the Electro-Optics/Laser Conf., Boston, 19-21 Nov. 1980
(Contract DE-AT03-76ET-51001; GA Proj. 3344)
(GA-A-16128; CONF-801139-3) Avail: NTIS HC A02/MF A01

A brief description is given of the protective armor plate as it pertains to both pyrometer and infrared camera requirements. The operating principles and test results for a number of these instruments are considered separately in two subsequent sections. A discussion of which camera and pyrometer proved to be most suitable for protective surveillance of the armor plate is given. DOE

N81-30980# California Univ., Livermore. Lawrence Livermore Lab.
ULTRASMOOTH PLASMA POLYMERIZED COATINGS FOR LASER-FUSION TARGETS
S. A. Letts, D. W. Myers, and L. A. Witt 26 Aug. 1980 23 p refs Presented to the 27th Natl. Am. Vacuum Soc. Symp., Detroit, 14-17 Oct. 1980 Revised
(Contract W-7405-eng-48)
(UCRL-84475-Rev-1; CONF-801037-12-Rev-1) Avail: NTIS HC A02/MF A01

Coatings for laser fusion targets were deposited up to 135 micrometers thick by plasma polymerization onto 140 micrometer diameter DT filled glass microspheres. Ultra-smooth surfaces (no defect higher than 0.1 micrometer) were achieved by eliminating particulate contamination. Process generated particles were eliminated by determining the optimum operating conditions of power gas flow, and pressure, and maintaining these conditions through feedback control. From a study of coating defects grown over known surface irregularities, a quantitative relationship between irregularity size, film thickness, and defect size was determined. This relationship was used to set standards for the maximum microshell surface irregularity tolerable in the production of hydrocarbon or fluorocarbon coated laser fusion targets. DOE

N81-30981# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
RESULTS OF PARAMETRIC NEUTRONIC STUDIES FOR HIGH-TEMPERATURE BLANKETS WITH BREEDING
H. Makowitz, O. W. Lazareth, J. R. Powell, and J. A. Fillo 1981 5 p refs Presented at the Am. Nucl. Soc. Ann. Meeting, Miami Beach, Fla., 7-12 Jun. 1981
(Contract DE-AC02-76CH-00016)
(BNL-28903; CONF-810606-10) Avail: NTIS HC A02/MF A01

A wide range of possible blanket configurations were examined. Neutronically viable blanket combinations that obtain an average breeding ratio of at least 1.1 and a sufficiently high fraction of fusion energy (20% HTE High Temperature Heat) in the HTE process steam were sought. After a preliminary and a secondary round of parametric calculations, ZrO2 was selected as the best ceramic material; and a shell design with a flux trap type of back breeding zone with a Zr or graphite plug was chosen as optimal for the HTE module. DOE

N81-30982# Los Alamos Scientific Lab., N. Mex.
SUPPRESSION OF IGNITION BY INTERFACE INSTABILITIES IN SMALL FUSION TARGETS
Ronald C. Kirkpatrick 1981 17 p refs Presented at the 4th Intern. Topical Conf. on High-Power Electron and Ion-Beam Res. and Technol., Palaiseau, France, 29 Jun. - 3 Jul. 1981
(Contract W-7405-eng-36)
(LA-UR-81-433; CONF-810620-1) Avail: NTIS HC A02/MF A01

Concern over hydrodynamic instabilities in small fusion targets has prompted numerous studies of instability onset, but few studies of the consequences. Here for the first time a mechanism is identified which tends to suppress ignition in small fusion targets. The mechanism is that of radiative energy loss into the increased area of a perturbed surface. Quantitative assessment of this mechanism is provided by modeling it in a 12 parameter burn code. It is contrasted with two other mechanisms and shown to be a significantly more serious consideration for DT ignition in the Wheeler mode. DOE

N81-30983# Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENTS IN TOKAMAK TRANSPORT MODELING
W. A. Houlberg, S. E. Attenberger, and L. L. Lao 1981 21 p refs Presented at the ANS/ENS Joint Topical Meeting on Math. Methods in Nucl. Eng., Munich, 27 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810415-7) Avail: NTIS HC A02/MF A01

A variety of numerical methods for solving the time dependent fluid transport equations for Tokamak plasmas is presented. Among the problems discussed are techniques for solving the sometimes very stiff parabolic equations for particle and energy flow, treating convection dominated energy transport that leads to large cell Reynolds numbers, optmizing the flow of a code to reduce the time spent updating the particle and energy source terms, coupling the one dimensional flux-surface-averaged fluid transport equations to solutions of the two dimensional Grad-Shafranov equation for the plasma geometry, handling extremely fast transient problems such as internal MHD disruptions and pellet injection, and processing the output to summarize the physics parameters over the potential operating regime for reactors. Emphasis is placed on computational efficiency in both computer time and storage requirements. DOE

N81-30984# Brookhaven National Lab., Upton, N. Y.
TRAIL: A TOKAMAK RAIL GUN LIMITER FOR FUSION REACTORS
James R. Powell, Wen-shi Yu, John A. Fillo, and John L. Usher 1980 12 p Presented at the Electromagnetic Guns and Launchers Conf., San Diego, Calif., Nov. 1980 Submitted for publication
(Contract DE-AC02-76CH-00016)
(BNL-29314; CONF-801138-9) Avail: NTIS HC A02/MF A01

An attractive limiter concept impacts a stream of moderate velocity pellets (100 to 200 m/sec) through the plasma edge region to absorb energy and define the plasma boundary. The pellets are recycled, after cooling, to the injector in an E-M mass accelerator. Heat fluxes of approximately 30,000 W/sq cm can be readily accommodated by the pellets, with very low recirculating power requirements (approximately 0.1%) for the accelerator. The mass accelerator velocity requirements are well within the present state-of-the-art (several km/sec). Accelerators injecting pellets at approximately 1 km/sec can be used to control local plasma temperature and current profiles and to act as energy absorbers to shut down the plasma without damage to the first wall if a plasma disruption occurs. DOE

N81-30985# Rocketdyne, Canoga Park, Calif.
DEFORMABLE MIRROR STUDY Final Report, 21 Jul. 1980 - 15 May 1981
A. B. Budgor Mar. 1981 164 p refs
(DOE/DP-40052/T1) Avail: NTIS HC A08/MF A01

The beam quality of a baseline system similar to the Helios system was analyzed with a two-dimensional beam train code based on a Fresnel propagator. The other components of the code include: (1) characteristics of phase aberrations either in terms of Zernike polynomials synthesized directly from optical component interferograms when available, or by constructing a random wave fron with specified statistics: (2) non-diffractive linear amplification via the Frantz-Nodvik equations; and (3) correction of accumulated phase aberration with continuous deformable mirrors whose surface is modeled by bicubic splines through the actuator points. The physical optics of beam train propagation is described. A heuristic physical argument defining the zeroth order efficacy of adaptive optics to correct phase aberration is then derived. The results of applying the diffraction computer code to one beam line of the Helios laser system are described. The wave length scalability of deformable mirrors and efficacy of deformable mirror adaptive optics to correct phase aberration at UV wave lengths are then described. DOE

N81-30986# Princeton Univ., N. J. Plasma Physics Lab.
TOROIDAL PLASMA ROTATION IN THE PLT TOKAMAK WITH NEUTRAL-BEAM INJECTION
S. Suckewer, H. P. Eubank, R. J. Goldston, J. McEnerney, N. R. Sauthoff, and H. H. Towner Apr. 1981 34 p refs
(Contract DE-AM02-76CH-03073)
(PPPL-1792) Avail: NTIS HC A03/MF A01

Plasma rotational velocities were measured in the Princeton large torus, under various plasma and neutral beam injection conditions using Doppler shifts of appropriate spectral lines. Without injection, a small but consistent toroidal rotation exists in a direction opposite to the plasma current (counter direction) in the plasma center but parallel to the current (co-direction) in the plasma periphery. With these measured velocities and the plasma density and temperature gradients, radial electron fields can be determined from theory, giving E/sub r/ equals approximatey 40 V/cm near the plasma center and E/sub r/ equals approximately 10 V/cm near the plasma edge. Insertion of a local, 2.5 percent magnetic well produced no observable effect on the beam driven rotation. Modeling of the time evolution and radial distribution of the rotation allows one to deduce an effective viscosity of the order of (1 to 5) x 10 the 4th power sq cm/sec. DOE

N81-30987# Los Alamos Scientific Lab., N. Mex.
HIGH-SPEED PHOTODETECTOR FOR PLASMA DIAGNOSTICS
P. B. Lyons, L. D. Looney, J. gle, R. D. Simmons, R. Selk, B. Hopkins, L. Hocker, M. Nelson, and P. Zagarino 1981 9 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 7-10 Apr. 1981 Prepared in cooperation with Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
(Contract W-7405-eng-36)
(LA-UR-81-1028; CONF-810429-17) Avail: NTIS HC A02/MF A01

Progress in four different classes of high speed photodetectors are reviewed with emphasis on parameters of importance in plasma diagnostics. Two types of biplanar vacuum photodiodes are compared, the ITT F4014 and the Hamamatsu 1328. A conventional photomultiplier, the nine stage Hamamatsu R928, has been modified to improve its bandwidth. Microchannel plate photomultipliers from two vendors were studied. Data for the ITT F4122X, ITT F4141, Varian VPM173, VPM-221, and VPM-225 are summarized. A hybrid photomultiplier using a PIN diode for a gain element is also discussed. DOE

N81-30988# Argonne National Lab., Ill.
HEAT-TRANSFER SCALING LAWS FOR MHD CHANNELS AND DIFFUSERS
R. K. Ahluwalia and K. H. Im 1980 9 p refs Presented at the 7th Intern. Conf. on MHD Elec. Power Generation, Cambridge, Mass., 16-20 Jun. 1980
(Contract W-31-109-eng-38)
(CONF-800617-10) Avail: NTIS HC A02/MF A01

A quasi-three dimensional flow model is used to study the convective and radiative heat transfer characteristics of coal fired MHD channels and diffusers. The radiative contributions of carbon dioxide, were vapor, potassium atoms, and slag particles are all included in the model. The scale up of heat transfer with the size of MHD channels and diffusers is characterized as an aid to extrapolation of experimental heat transfer measurements. The scale up of radiation with the channel or diffuser size, centerline temperature, wall temperature, boundary layer thickness, gas pressure, and average size and number density of slag particles is investigated. Generalized plots of gas emissivity and absorptivity are provided for use in estimating radiative heat transfer in MHD channels and diffusers. DOE

N81-30989# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
ANALYTICAL TREATMENT OF THE RUNAWAY EFFECT. PART 2: EVALUATION OF THE INTEGRAL I SUB M (ALPHA) = THE INTEGRAL OF X(M)E(-(X SQUARED + ALPHA)) DX BETWEEN THE LIMITS OF ZERO TO INFINITY
H. J. Kaeppeler Sep. 1980 13 p refs In GERMAN; ENGLISH summary
(IPF-80-7-Pt-2) Avail: NTIS HC A02/MF A01

In the analytical treatment of the runaway effect, encountered when a stationary electric field is imposed on a plasma, and of the ensuing current-driven instabilities, there appear integrals of the form: integral from zero to infinity of x sub m times exp (-(x square + a/x)) dx. Solutions for these integrals can be approximated by modified Bessel functions in such a way that the error involved is typically only 1% while at the same time an analytical derivation of the dispersion of the electron distribution function and relation of the instabilities becomes possible. Author (ESA)

N81-30990# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
INVESTIGATIONS OF ELECTROSTATIC WAVES WITH LARGE AMPLITUDES
K. Weixelbaum Sep. 1980 88 p refs In GERMAN; ENGLISH summary
(IPF-80-12) Avail: NTIS HC A05/MF A01

Electron plasma waves and ion-acoustic waves of finite amplitude are studied by means of the Vlasov equation. Linear theory is reviewed and analytical solutions of the dispersion relation are compared with direct numerical solutions of the Vlasov and Poisson equations. The nonlinear case, involving finite amplitude waves, is then illustrated for three typical examples : (1) propagation of large ion-acoustic waves; (2) the influence of the ion bounce effect on such waves; and (3) the influence of the electron bounce effect. Stationary external electric fields are shown to excite a broad fluctuation spectrum, leading to turbulent resistivity and turbulent heating of the plasma. The fast ions produced in that process are analyzed and their distribution function is calculated. Author (ESA)

N81-30991# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
[RESEARCH ACTIVITIES OF THE INSTITUTE FOR PLASMAPHYSICS] Annual Report, 1979 [FORSCHUNGSBERICHT 1979]
1980 39 p refs In GERMAN
Avail: NTIS HC A03/MF A01

Fusion research activities are summarized for the following areas: (1) radio frequency heating of inhomogeneous plasmas, in particular by means of magnetosonic and Alfven waves; (2) equilibrium studies of a toroidal high-voltage pinch configuration heated by shock waves; (3) plasma diagnostics by means of laser beams involving both coherent and incoherent scattering; and (4) development of a plasma focus device capable of yielding 10 to the 12th power neutrons per discharge. Author (ESA)

N81-30992# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
STUDIES OF STRONG LABORATORY DOUBLE LAYERS AND COMPARISON WITH COMPUTER SIMULATION
K. D. Baker, L. P. Block, R. Kist, W. Kampa, N. Singh, and H. Thiemann Sep. 1980 51 p refs Sponsored by Swedish

Board for Space Activities, Alexander von Humboldt Stiftung Foundation and Deutsche Forschungsgemeinschaft Prepared in cooperation with Frauhoper Inst., Freiburg, West Germany
(TRITA-EPP-80-08; ISSN-0348-7539) Avail: NTIS HC A04/MF A01

Strong electrostatic double layers were produced with triple plasma configuration in a large plasma chamber (5 m long, 2.5 m diameter). Due to relatively low densities (10 to the 11th power to 10 to the 12th power per cu m), Debye lengths of a few centimeters and layer thicknesses of the order of a meter were obtained. Layers both with and without magnetic fields were studied. Analysis of particle spectra prove that wave-particle interactions play a minor role in maintaining the strong electric field. The three dimensional potential distribution is measured and is qualitatively discussed in terms of particle budget. For cases with a magnetic field it tends to agree with observations above the aurora. Comparisons are made with double layer theory and computer experiments, and general agreement is found as far as the available results allow. Author (ESA)

N81-30993# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.
A CONSTANT HEAT FLUX PLASMA LIMITER FOR TEXTOR
P. Mioduszewski Oct. 1980 25 p refs
(Juel-1681; ISSN-0366-0885) Avail: NTIS HC A02/MF A01

Heat removal from plasmas by solid material limiters is studied and the theoretical basis for designing a poloidal plasma limiter with locally constant surface load is given. The shape of this limiter is a function of the scrape-off layer characteristics. Rail limiters and ring limiters are compared with respect to heat accommodation and requirements for plasma positioning. The limiter contour for constant energy flux density is studied. Assuming an exponential decay of the power flux in the scrape-off layer, the specific shape is a function of the e-folding length. The optimization of thermal response of the limiter is considered, such that the energy flux density is constant over the whole limiter surface. For the ohmically heated TEXTOR an Inconel limiter with 5 MW/sq m seems appropriate, whereas high auxiliary heating might call for a graphite limiter for secure operation.
Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N81-30994 Arizona State Univ., Tempe.
THEORETICAL AND EXPERIMENTAL STUDIES IN CRYSTAL CHEMISTRY Ph.D. Thesis
Cheryl Lynn Shavers 1981 228 p
Avail: Univ. Microfilms Order No. 8115607

Pattern recognition techniques were applied to the separation of crystal structure types according to values of atomic variables such as electronegativity and orbital radii. These techniques were also used to obtain useful and reliable structural maps, often using a higher dimensional space, and to establish objective guidelines for the prediction of structure types and properties of new inorganic solids. Stoichiometries examined were the octet compounds AB, AB2, A2B and ABX2 (ABXY), where A represents the less electronegative species. Regression analyses were also undertaken to test whether orbital radii might be of value in predicting bond energies. The synthesis and structure determination of a number of new inorganic materials was undertaken and the roles of nonbonded interactions of tetrahedral structures related to (mainly) the sphalerite and wurtzite types were examined. Dissert. Abstr.

N81-30995# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SELF-CONSISTENT TREATMENT FOR THE HUBBARD MODEL FOR IMPURITIES IN SEMICONDUCTORS [UM TRATAMENTO AUTOCONSISTENTE PARA O MODELO DE HUBBARD PARA IMPUREZAS EM SEMICONDUTORES]
I. C. daCunha Lina, R. Kishore, and A. Ferreira daSilva Nov. 1980 3 p refs In PORTUGUESE; ENGLISH summary Submitted for publication
(INPE-1874-RPE/219; Preprint-20) Copyright. Avail: NTIS HC A02/MF A01

The self consistent method of Fedro and Wilson, later on extended by Kishore, for the calculation of Green's function is applied to the problem of impurities in semiconductors. The Hubbard Hamiltonian is used and the effect of disorder is treated according to the method of Matsubara-Toyozawa. Because of the electron correlations, two impurity bands are obtained and the density of states of these bands for various values of the impurity concentrations is calculated. Author

N81-30996# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE VALIDITY OF THE MUFFIN-TIN CLUSTER METHOD FOR CRYSTALS: THE EXAMPLE OF CuCl ENERGY BANDS
Paulo S. Guimaraes, Nelson J. Parada, and Luiz G. Ferreira Aug. 1981 16 p refs Submitted for publication
(INPE-2203-RPE/012) Copyright. Avail: NTIS HC A02/MF A01

The necessary conditions for a successful crystal band structure calculation through an atom cluster are determined. Larger clusters are needed in the case of small gap semiconductors and in the case of metals. The procedures are exemplified by studying the bands of CuCl under pressure. M.G.

N81-30997# Michigan Univ., Ann Arbor. Electron Physics Lab.
MICROWAVE SEMICONDUCTOR MATERIALS AND DEVICES Final Report, 1 Nov. 1979 - 31 Dec. 1980
P. A. Blakey, J. Chen, J. R. East, R. K. Froelich, R. O. Grondin, G. I. Haddad, and B. L. Mattes Jan. 1981 33 p refs
(Grant AF-AFOSR-2939-76; AF Proj. 2305)
(AD-A098112; Rept-014306-F; AFOSR-81-0404TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

The purpose of this program was to carry out fundamental studies in semiconductor materials and devices which are suitable for improving the state of the art in microwave and millimeter-wave power generation, amplification and detection. During the past year there were several active tasks under this program. A summary of each task is included in this report. Author (GRA)

N81-30998# Spire Corp., Bedford, Mass.
RESEARCH ON HgCdTe FABRICATION USING DIRECTED ENERGY TECHNIQUES Semiannual Technical Report, 16 Aug 1979 - 29 Feb. 1980
Anton C. Greenwald and Robert G. Wolfson May 1981 50 p refs
(Contract MDA903-79-C-043; DARPA Order 3800)
(AD-A101240; SAR-81-10071-03) Avail: NTIS HC A03/MF A01 CSCL 20/2

The goal of this research is to produce large-area, thin-film, single crystal HgCdTe material for infrared detectors. The successful approach is to (1) evaporate CdTe in an enclosed furnace on insulating crystalline substrates (hot wall epitaxy), (2) melt a thin surficial layer by pulsed electron beam irradiation to improve morphology, and (3) convert to HgCdTe by evaporation and diffusion at constant temperature. The final result is a single crystal film of Hg(1-x)CdxTe, 30 microns thick and 0.5 inch square, with a compositional variation of x less than + or = 0.0007. Films of up to 20 microns thick, 1 inch o.d., single crystal (but twinned) CdTe were produced by the first process. These faceted films were smoothed without change of surface stoichiometry or structure by the second process. Evaporation of HgTe at less 0.5 atm Hg overpressure onto the CdTe film produced the final result on mica or quartz substrates. Electron mobility at 77 K was as high as 1.5 x 100,000 sq cm/V-s in the final samples. Author (GRA)

N81-30999# Army Armament Research and Development Command, Watervliet, N. Y.
SUPERCONDUCTIVITY IN PRESSURE QUENCHED CADMIUM SULFIDE AT 77 K
C. G. Homan, K. Laojindapun, and R. K. MacCrone May 1981 22 p refs
(AD-A101265; AD-E440125; ARLCB-TR-81020) Avail: NTIS

HC A02/MF A01 CSCL 07/2

Observations of magnetic field induced collapse of Meissner sized diamagnetism with a coincident decrease in electrical conductivity in pressure quenched CdS material at 77 K are reported. These results are consistant with the existence of superconducting regions in the specimens at this temperature. GRA

N81-31000# RCA Labs., Princeton, N. J. Microwave Technology Center.

MONOLITHIC GaAs DUAL-GATE FET PHASE SHIFTER Tri-Annual Report, 1 Jan. - 30 Apr. 1981

M. Kumar, S. N. Subbarao, and R. Menna May 1981 15 p
(Contract N00014-79-C-0568; RF62581001)
(AD-A101667; PRRL-81-CR-13; PRRL-251-037-Y; TAR-2)
Avail: NTIS HC A02/MF A01 CSCL 09/5

Progress is reported. (1) The photomask of a 0 to 90 deg monolithic GaAs dual-gate FET phase shifter was designed and ordered from Photronics Labs, Inc. in Connecticut. The estimated delivery date is late June 1981. (2) A technique for fabricating 'via' holes using laser drilling was developed. This technique can drill a 1-mil-diameter via hole through a 4-mil-thick GaAs substrate without much undercut and without an infrared microscope for backside alignment. (3) A four-way, in-phase combiner on Al2O3 substrate has been developed with good performance. The same design is being modified for fabrication on GaAs semi-insulating substrates. This four-way, in-phase combiner is needed for the 0 to 360 deg phase shifter that will be developed in the next phase. Author (GRA)

N81-31001# IBM Watson Research Center, Yorktown Heights, N.Y.

INVESTIGATION OF QUANTUM EFFECTS IN HETEROSTRUCTURES Final Report, 1 Apr. 1978 - 31 Mar. 1981

Leo Esaki 31 Mar. 1981 19 p refs
(Contract DAAG29-78-C-0007)
(AD-A101693; ARO-15229.25-P) Avail: NTIS
HC A02/MF A01 CSCL 20/12

Semiconductor superlattices made of periodic, ultra-thin layers of In(1-x)Ga(x)As and GaSb(1-y)As(y) are grown by molecular beam epitaxy. The epitaxial process is established to provide atomically smooth interfaces and precisely controlled thickness and composition. Quantum states or subbands are created, which have been investigated experimentally and analyzed theoretically. Unique properties of this superlattice system, such as the semiconductor-semimetal transition and the spatial separation of carriers, have been observed. Energy positions and dispersion of the subbands and the existence of multiple subbands have been studied through a variety of physical measurements, primarily, magneto-oscillations and absorptions. The effect of the superlattice potential on the band structure at different points in the momentum space has also been demonstrated from electroreflectance measurements for both the In(1-x)Ga(x)As-GaSb (1-y)As(y) and the GaAs-Ga(1-x)A1(x)As system. Author (GRA)

N81-31002# Sandia Labs., Albuquerque, N. Mex.

RADIATION-INDUCED CONDUCTIVITY AND HIGH TEMPERATURE Q CHANGES IN QUARTZ RESONATORS

D. R. Koehler 1981 29 p refs Presented at the 35th Ann. Frequency Control Symp., Philadelphia, 27 May 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-0126C; CONF-810550-1) Avail: NTIS
HC A03/MF A01

Radiation induced conductivity measurements was carried out with a 200 kV, 14 mA X-ray machine producing 5 rads/s. With electric fields of the order of 10 to the 6th power V/cm, the noise level in the current measuring systems was equivalent to an ionic current generated by quartz impurities in the J ppb range. The accuracy of the high temperature (300 to 800 K) 1/Q measurement technique was determined. A number of resonators constructed of quartz material of different impurity contents were tested and both the radiation induced conductivity and the high temperature 1/Q results compared with earlier radiation induced frequency and resonator resistance changes. DOE

N81-31003# Brookhaven National Lab., Upton, N. Y.

MONTE CARLO CALCULATIONS IN LATTICE GAUGE THEORY

Michael Creutz 1981 8 p refs Presented at the Conf. on Perturbative Quantum Chromodyn., Tallahassee, 25 Mar. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29457; CONF-810368-1) Avail: NTIS
HC A02/MF A01

Progress in numerical studies of the Feynman path integral for non-Abelian gauge theories is reviewed. In the quarkless theory, numerical relations between the glueball mass, the confinement potential, and the scale of asymptotic freedom were obtained. Renormalization group analysis confirmed that the Gell-Mann Low function for the lattice SU(2) theory of Wilson has no non-trivial zeros. New phase transition were found in SU(4) and SU(5) gauge theories. These may be an artifact of the Wilson form for the action. DOE

N81-31004# National Bureau of Standards, Washington, D.C. ElectroMagnetic Technology Div.

DEVELOPMENT OF STANDARDS FOR SUPERCONDUCTORS, FY 1980 Annual Report

F. R. Fickett, L. F. Goodrich, and A. F. Clark Dec. 1980 216 p refs
(Contract EA-77-A-01-6010)
(PB81-176141; NBSIR-80-1642) Avail: NTIS
HC A10/MF A01 CSCL 20L

The critical current standard for superconductors was investigated through a survey of manufacturers. Experimental determinations of the effect of various parameters on the measurement were made by NBS and by the wire manufacturers. Significant progress was made in the preparation of the actual critical current measurement standard and the definition standard. GRA

N81-31005# Texas Univ., Austin. Dept. of Chemistry.

VISIBLE LIGHT-INDUCED ELECTRON EJECTION FROM ANIONS

Marye Anne Fox, James R. Hohman, and Robert C. Owen 1980 3 p refs Presented at the 3rd Intern. Conf. on Photochem. Conversion and Storage of Solar Energy, Golden, Colo., 3 Aug. 1980
(Contract DE-AS05-77ER-05528)
(DOE/ER-05528/28; CONF-800827-6) Avail: NTIS
HC A02/MF A01

The photochemistry of carbanions at the surface of a doped n-TiO2 electrode is described. Resonance stabilized anions (A-) often strongly absorb visible light, giving rise to photoreactivity initiated by primary photochemical electron transfer. In the absence of reactive electron acceptors, this electron ejection is often followed by rapid thermal collapse of the radical electron pair to regenerate the anionic starting material. Thus, the observation of solution phase photochemistry in carbanions depends directly on inhibition of electron recapture. Since this inhibition is a key feature of photoelectrochemistry at semiconductor electrodes, it is anticipated that a parallel may exist between photocurrent production in anion sensitized photogalvanic cells and relative quantum efficiency for homogeneous photoreactions of such anions. DOE

N81-31006# Argonne National Lab., Ill. Materials Science Div.

VOID STRENGTHENING

R. O. Scattergood and D. J. Bacon (Liverpool Univ.) 1980 7 p refs Presented at the Intern. Conf. on Dislocation Modelling of Phys. Systems, Gainesville, Fla., 22-27 Jun. 1980
(Contract W-31-109-eng-38)
(CONF-800696-2) Avail: NTIS HC A02/MF A01

The optical stress necessary for a dislocation to cut through a row of equispaced voids using anisotropic elasticity and the complete dislocation self force was determined. A representative example of strengthening mechanism calculation is given. The void dislocation boundary conditions were treated by an approximate method. A correlation decribing the critical stress was developed, and elastic anisotropy was included for the shear modulus and Poisson ratio. Dislocation self interaction is manifest as a critical line tension cusp angle and a logarithms cutoff parameter for the line energy. It is concluded that voids are strong obstacles to dislocation motion, with critical stress values about 70% or more of the Orowan stress. DOE

N81-31007# Argonne National Lab., Ill.
EFFECTS OF MAGNETIC ATOMS ON THE PROPERTIES OF TERNARY SUPERCONDUCTORS
B. D. Dunlap and G. K. Shency 1980 10 p refs Presented at the 5th Intern. Conf. on Hyperfine Interactions, Berlin, 21-25 Jul. 1980
(Contract W-31-109-eng-38)
(CONF-800766-4) Avail: NTIS HC A02/MF A01

The effects of magnetism on ternary superconductors are discussed. In some cases, the addition of magnetic atoms is found to enhance superconducting properties by increasing the superconducting critical field without significantly lowering the transition temperature. In many cases compounds show both superconducting and long range magnetic ordering transitions. The destruction of superconductivity by ferromagnetic ordering and the coexistence of superconductivity with antiferromagnetic ordering is well established. Hyperfine interaction measurements, played a significant role in the investigation of these materials, including measurement of the magnitude of the exchange interaction between rare earth spin and conduction electron spin, elucidation of the mechanism for critical field enhancement, specification of crystalline field ground states, and studies of the nature of magnetic ordering. DOE

N81-31008# Argonne National Lab., Ill.
STUDY OF THE ANISOTROPY OF THE THRESHOLD ENERGY IN COPPER USING IN SITU ELECTRICAL RESISTIVITY MEASUREMENTS IN THE HVEM
W. E. King, K. L. Merkle, and M. Meshii 1980 5 p refs Presented at the 6th Intern. Conf. on High Voltage Microscopy, Antwerp, 1-3 Sep. 1980
(Contract W-31-109-eng-38)
(CONF-800903-3) Avail: NTIS HC A02/MF A01

The threshold energy surface for copper was determined by in situ electrical resistivity measurements below 10 K in the high voltage electron microscopy (HVEM). By combining the advantages of both the electrical resistivity and HVEM techniques, this high voltage electron microscopy approach allowed a precise and detailed study of the anisotropy of the threshold energy for Fenkel pair production. DOE

N81-31009# Ames Lab., Iowa.
FERMI-SURFACE PROPERTIES OF MIXED-VALENT MATERIALS
G. W. Crabtree, W. R. Johanson, A. S. Edelstein (Energy Conversion Devices, Inc., Troy, Mich.), and O. D. McMasters 1981 4 p refs Presented at the Intern. Conf. on Valance Fluctuations in Solids, Santa Barbara, Calif., 27-30 Jan. 1981 Prepared in cooperation with Argonne National Lab. Ill. and Illinois Univ. at Chicago Circle
(Contracts W-7405-eng-82; W-31-109-eng-38)
(IS-M-324; CONF-810129-4) Avail: NTIS HC A02/MF A01

Data are presented for the study of mixed valent Fermi surface properties of CeSn3 and LaSn3. Some qualitative implications for mixed valence in CeSn3 are also discussed.DOE

N81-31010# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PHYSICAL AND CHEMICAL CHARACTERIZATION OF INTERFACES BY ELECTRON OPTICAL METHODS
G. Thomas, R. Gronsky, O. L. Krivanek, and R. K. Mishra Apr. 1981 28 p refs Presented at the 7th LBL/MMRD Intern. Mater. Symp. Surfaces and Interfaces in Ceram. and Ceram.-Metal Systems, Berkeley, Calif., 28-30 Jul. 1980 Prepared in cooperation with California Univ., Berkeley
(Contract W-7405-eng-48; Grant NSF DMR-77-24022)
(LBL-11413; CONF-800765-8) Avail: NTIS HC A03/MF A01

Developments in the study of ceramics using transmission electron microscopy are discussed. Particular attention is given to improvements in instrumentations, particularly high voltage, high resolution and analytical microscopes. DOE

N81-31011# IBM Watson Research Center, Yorktown Heights, N.Y.
ELECTRONIC PROPERTIES OF HIGHLY-DOPED Si(111)-(1X1) SURFACES PREPARED BY LASER ANNEALING
D. E. Eastman, P. Heimann, F. J. Himpsel, B. Reihl, D. M. Zehner, and C. W. White 1981 5 p refs Presented at the 8th Ann. Conf. on the Phys. of Compound Semicond. Interfaces, Williamsburg, Va., 27 Jan. 1981 Prepared in cooperation with Oak Ridge National Lab., Tenn.
(Contracts W-7405-eng-26; F49620-80-C-0025)
(CONF-810146-1) Avail: NTIS HC A02/MF A01

Highly degenerate n-type and p-type Si(111)-(1x1) surfaces were prepared by As and B ion implantation and laser annealing, and studied using high resolution (approximately 0.1 to 0.2 eV) photoemission with synchrotron radiation in the photon energy range 12 less than or equal to h/ sub v/ less than or equal to 130 ev. DOE

N81-31012# Argonne National Lab., Ill.
APPLICATION OF THE HIGH-VOLTAGE ELECTRON MICROSCOPE TO QUANTITATIVE DEFECT-PRODUCTION STUDIES USING IN-SITU ELECTRICAL-RESISTIVITY MEASUREMENTS
W. E. King (Northwestern Univ.), K. L. Merkle (Northwestern Univ.), and M. Meshii 1980 5 p refs presented at In-Situ Experimental Session of the 6th Intern. Conf. on High Voltage Electron Microscopy, Antwerp, 1-3 Sep. 1980
(Contract W-31-109-eng-38)
(CONF-800903-2) Avail: NTIS HC A02/MF A01

A side entry type, single tilt cryogenic specimen stage that has the capability of in-situ electrical resistivity measurements at T < 10 K in the Kratos-AEI EM7 1200-keV HVEM was developed. This stage permits not only in-situ electrical resistivity measurements, but also in-situ irradiation and observation of the same specimen. This technique was applied to the determination of the threshold energy surface for copper, the results of which are reported. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N81-31013# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A THEORY FOR AN ISING SPIN GLASS WITH RANDOM ANISOTROPY [UMA TEORIA DE SPIN GLASS DE ISING COM ANOSOTROPIA ALEATORIA]
M. Cristina Forti, R. Kishore, and I. C. daCunhaLima May 1981 23 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Reuiao da SBPC
(INPE-2085-RPE/317) Avail: NTIS HC A02/MF A01

The Ghatak and Sherrington theory for an Ising spin glass was extended for random anisotropy. The susceptibility and specific heat were calculated using a Gaussian distribution of probability for the magnitude of the random anisotropy. This effect shows a cusp in the susceptibility but not in the specific heat. Author

N81-31014# Argonne National Lab., Ill. Chemical Engineering Div.
THERMODYNAMIC PROPERTIES OF URANIUM DIOXIDE
J. K. Fink, M. G. Chasanov, and L. Leibowitz Apr. 1981 175 p refs
(Contract W-7405-eng-38)
(ANL/CEN/RSD-80-3) Avail: NTIS HC A08/MF A01

In order to provide reliable and consistent data on the thermophysical properties of reactor materials for rector safety studies, revision was prepared for the thermodynamic properties of the uranium dioxide portion of the fuel property section of the report Properties for Liquid Metal Fast Breeder Reactors Safety Analysis. International agreement was reached on a vapor pressure equation for the total pressure over UO2, for the calculation of enthalpy and heat capacity, and a phase change at 2670 K. An electronic term is used in place of the Frenkel defect term in the enthalpy and heat capacity equation and the phase transition is accepted. DOE

N81-31015# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NATURAL CONVECTION BETWEEN CONCENTRIC (HORIZONTAL) CIRCULAR CYCLINDERS BY A PENALTY-FINITE ELEMENT
A. Satake and J. N. Reddy Mar. 1981 18 p refs Presented at Second Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Venice, 13-16 Jul. 1981 Prepared in cooperation with Oklahoma Univ., Norman
(PB81-183659; VPI-E-81-8) Avail: NTIS HC A02/MF A01 CSCL 20M

The paper presents numerical results obtained by a penalty finite element model for natural convection between concentric horizontal cylinders in the presence of temperature gradient between the inner and outer cylinders. The results are compared with experimental results as well as other approximate solutions for moderately high Rayleigh numbers, R sub A. The agreement is found to be very good. Finite element results are also presented for natural convection in a half circular annulus for R sub A = 1000 and 100,000. These results should serve as test cases for other investigators. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N81-31016# Midwest Research Inst., Golden, Colo. Planning, Applications, and Impacts Div.
ORGANIZATIONAL PRECEDENTS FOR OWNERSHIP AND MANAGEMENT OF DECENTRALIZED RENEWABLE-ENERGY SYSTEMS
Richard Meunier and Jo Ann Silversmith Mar. 1981 62 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(SERI/TR-744-312) Avail: NTIS HC A04/MF A01

Three existing organizational types that meet the decentralization criteria of local consumer ownership and control - cooperatives, Rural Electric Cooperatives, and municipal utilities - are examined. These three organizational precedents are analyzed in terms of their histories, structures, legal powers, sources of capital, and social and political aspects. Examples of related experiments with renewable energy technologies are given, and inferences are drawn regarding the organizations' suitability as vehicles for future implementation of decentralized renewable energy systems. DOE

N81-31017# Advanced Technology, Inc., McLean, Va.
PROJECT TRACKING SYSTEM (PTS) USER'S MANUAL
E. B. Mohr Mar. 1981 179 p
(Contract DE-AC19-79BC-10070)
(DOE/BC-10070/1) Avail: NTIS HC A09/MF A01

The Bartleville Energy Technology Center (BETC) Project Tracking System (PTS) is a computerized information system developed to generate automatic updates to other Department of Energy (DOE) systems such as the Business Management Information Systems (BMIS), as well as to aid in the in-house tracking of the cost, schedule, and manpower status of the approximately 200 BETC contracts. The PTS data base contains administrative and limited technical information on planned, active, and terminated contracts. The PTS software and data base are resident upon BEtC's PDP 11/70 computer, which utilizes the RSX-11M operating system. PTS programming was done in the BASIC + II and DATA-TRIEVE languages, which allow for conversational, English-like interactions between the user and the system during both input and output sessions. DOE

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N81-31018* National Aeronautics and Space Administration, Washington, D. C.
DATA BASES AND DATA BASE SYSTEMS RELATED TO NASA'S AEROSPACE PROGRAM. A BIBLIOGRAPHY WITH INDEXES
Jun. 1981 511 p
(NASA-SP-7045) Avail: NTIS HC $35.00 CSCL 05B

This bibliography lists 1778 reports, articles, and other documents introduced into the NASA scientific and technical information system, 1975 through 1980. Author

N81-31019*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
USER REQUIREMENTS FOR NASA DATA BASE MANAGEMENT SYSTEMS. PART 1: OCEANOGRAPHIC DISCIPLINE
Brad Fujimoto 15 Jun. 1981 58 p refs
(Contract NAS7-100)
(NASA-CR-164701; JPL-Pub-81-50-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 05B

Generic oceanographic user requirements were collected and analyzed for use in developing a general multipurpose data base management system for future missions of the Office of Space and Terrestrial Applications (OSTA) of NASA. The collection of user requirements involved; studying the state-of-the-art technology in data base management systems; analyzing the results of related studies; formulating a viable and diverse list of scientists to be interviewed; developing a presentation format and materials; and interviewing oceanographic data users. More effective data management systems are needed to handle the increasing influx of data. A.R.H.

N81-31020*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DATA BASE MANAGEMENT SYSTEMS PANEL. THIRD WORKSHOP SUMMARY
Jose L. Urena, ed. 15 Jul. 1981 39 p refs Workshop held at Greenbelt, Md., 10-12 Dec. 1980
(Contract NAS7-100)
(NASA-CR-164705; JPL-Pub-81-52) Avail: NTIS HC A03/MF A01 CSCL 05B

The discussions and results of a review by a panel of data base management system (DRMS) experts of various aspects of the use of DBMSs within NASA/Office of Space and Terrestrial Applications (OSTA) and related organizations are summarized. The topics discussed included the present status of the use of DBMS technology and of the various ongoing DBMS-related efforts within NASA. The report drafts of a study that seeks to determine the functional requirements for a generalized DBMS for the NASA/OSTA and related data bases are examined. Future problems and possibilities with the use of DBMS technology are also considered. A list of recommendations for NASA/OSTA data systems is included. A.R.H.

N81-31021# Defense Technical Information Center, Alexandria, Va.
GOVERNMENT ACRONYMS AND ALPHABETIC ORGANIZATIONAL DESIGNATIONS USED IN DTIC Progress Report, period ending May 1981
Loretta M. Brown, comp. Jun. 1981 61 p
(AD-A101300; DTIC/TR-81/5) Avail: NTIS HC A04/MF A01 CSCL 05/2

This compilation is a guide to acronyms as assigned by the Defense Technical Information Center (DTIC). The listing contains

entries from the Department of Defense (DoD), Federal Government and foreign military organizations. The acronyms reflect reports processed into the DTIC collections. In all instances, the acronyms are those actually used by the organizations itself. The listing is arranged in three parts, as follows: alphabetically by acronym; alphabetically by full name of organization, and numerically by Corporate Author (Source Header) code as used in DTIC. GRA

N81-31022# Decisions and Designs, Inc., McLean, Va.
PROGRAM OBJECTIVES MEMORANDUM DATA BASE MANAGEMENT SYSTEM (POM-DBMS). USERS MANUAL
Kathleen A. Waslov and Kenneth P. Kuskey Washington USMC May 1981 105 p
(Contract M00027-80-C-0047)
(AD-A101695; UM-81-158; USMC-80C047-UM-01) Avail: NTIS HC A06/MF A01 CSCL 05/1

The POM-development process at Marine Corps Headquarters (HQMC) is the focal point for annually reassessing the Marine Corps' (MC's) overall priorities for present and future spending. Approximately 450 individual programs compete for programmed funds during each year's POM cycle. Since 1977, HQMC has sponsored the development of a data base management system (DBMS) to support the staff of the Deputy Chief of Staff for Requirements and Programs as it prepares the Commandant's (CMC's) POM Submission to the Secretary of the Navy. The POM DBMS is HQMC's central repository of priority and cost information during POM development, and it is the MC staff's primary tool for constructing and adjusting the CMC's program for the MC. The POM DBMS is used (1) to develop the CMC's POM submission to the Department of the Navy; (2) to determine appropriation controls for the CMC's program; and (3) to provide program-element detail on the CMC's program to aid in the preparation of updates to the Five Year Defense Program. The system supports the MC staff throughout the POM development, including the collection of data, the prioritization of initiatives, the packaging of initiatives into a program of consolidated decision package sets and the revision of this program based on the Secretary of Defense's Program Decision Memorandum and Amended Program Decision Memorandum. It is also used in the POM-to-budget process to determine MC appropriation controls. The objective of the Users Manual for the POM DBMS is to provide the user's non-ADP personnel with the information necessary to effectively use the system.
Author (GRA)

N81-31023# Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.
COMPARISON OF SYSTEM-2000 AND SCIENTIFIC INFORMATION RETRIEVAL (SIR) IN A SPECIFIC SCIENTIFIC APPLICATION
Veronica Evans 1981 41 p Presented at the ASTUTE Spring Conf., Austin, Tex., 25 Mar. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29228; CONF-810361-1) Avail: NTIS HC A03/MF A01

The computer on which these reside is a CDC-6600 and the operating system is NOS-BE level 488. For this comparison study a new S2K data base and a SIR data base were created using a subset of the actual raw data from the original Acid Rain data base. Identical data was loaded in both data bases and the procedures followed were duplicated as closely as possible on both. All jobs were run in batch mode to get accurate statistics on computer time and resources. The results of certain specific procedures in terms of computer resources are discussed and the ease of implementing these procedures from the user's standpoint is illustrated. DOE

N81-31024# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
MODELLING SUMMARY DATA
R. R. Johnson 1981 18 p refs Presented at ACM/SIGMODE Intern. Conf. on Management of Data, Ann Arbor, Mich., 29 Apr. - 1 May 1981 Submitted for publication
(Contract W-7405-eng-48)
(LBL-12350; CONF-810467-2) Avail: NTIS HC A02/MF A01

Several problems in specifying aggregate functions in relational systems are investigated. A solution is proposed to these problems in the form of an extension of the relational data model. In particular the concept of summary data is introduced. The query language STRAND is presented in order to describe retrieval operations on the extended model. STRAND allows a user to formulate queries involving aggregate functions with conceptualizing the query in terms of aggregation. Two example applications, proposal tracking and sociodemographic data bases, are used to illustrate the concepts of the extended model. DOE

N81-31025# Oak Ridge National Lab., Tenn. Engineering Physics Div.
INPUT PARAMETERS FOR LEAP AND ANALYSIS OF THE MODEL 22C DATA BASE
L. Stewart and Moshe Goldstein May 1981 226 p refs
(Contract W-7405-eng-26)
(ORNL-5746) Avail: NTIS HC A11/MF A01

The structure of the data base is briefly outlined and an attempt made to categorize the parameters according to the methods employed for estimating the numerical values. Due to incomplete documentation and/or lack of specific parameter definitions, few of the input values could be traced and uniquely interpreted using the information provided in the primary and secondary sources. Input parameter choices were noted which led to output projections which are somewhat suspect. Other data problems encountered are summarized. Some of the input data were corrected and a revised base case was constructed. The output projections for this revised case are compared with the Model 22C output for the year 2020, for the transportation sector. DOE

N81-31026# PEDCo-Environmental, Inc., Cincinnati, Ohio.
FLUE GAS DESULFURIZATION INFORMATION SYSTEM (FGDIS) DATA BASE USER'S MANUAL
M. Smith Mar. 1981 127 p Sponsored in part by EPA
(PB81-162505) Avail: NTIS HC A07/MF A01 CSCL 05B

A guide is provided for the use of the Flue Gas Desulfurization Information System (FGDIS) data base which is a collection of data files consisting of information pertaining to the design and performance of flue gas desulfurization (FGD) systems. GRA

N81-31027# National Bureau of Standards, Washington, D.C. Application Systems Div.
DESIGN OF INFORMATION SYSTEMS USING SCENARIO-DRIVER TECHNIQUES
W. Terry Hardgrave, Sandra B. Salazar, and Edwin J. Beller, III Mar. 1981 25 p refs
(PB81-180986; NBSIR-81-2240) Avail: NTIS HC A02/MF A01 CSCL 05B

A technique is described for developing information systems using a scenario driven design approach. The approach emphasizes client participation in the design process. The first step is to develop a collection of 'scenarios' which document the interaction between the computer and the human user. Using the scenarios, information flow diagrams and database designs are constructed. They are used to establish disk capacity requirements and transaction rates, and finally to specify all hardware and software requirements. The scenarios, the information flow technique, and the database design approach using, as an example, a small business application are described. GRA

N81-31028# Computer Corp. of America, Cambridge, Mass.
OVERVIEW OF THE CHEMICAL SUBSTANCES INFORMATION NETWORK
R. Winter, Tomas Lozano-Perez, Donald E. Eastlake, III, and Ronni L. Rosenberg 1 Apr. 1981 19 p refs Sponsored in part by Environmental Protection Agency and National Library of Medicine
(Contract EQ8AC028)
(PB81-191009; CCA-81-03) Avail: NTIS HC A02/MF A01 CSCL 05B

The Chemical Substances Information Network (CSIN), a coordinated network of online chemical information systems, is outlined. The history of CSIN, the benefits of its use, and its technical capabilities are discussed. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N81-31029# Societe Nationale Industrielle Aerospatiale, Paris (France).
ARIANE TODAY AND TOMORROW
Luc Guillard 1980 13 p Presented at French Aerospace Week, Djakarta, Indonesia, 8-12 Dec. 1980
(SNIAS-802-422-109) Avail: NTIS HC A02/MF A01

The six years (1974 to 1980) of the ARIANE program are reviewed. The failure of the second ARIANE launch due to combustion instability at a high frequency (above 2,000 Hz) on one of the first stage engines is described. Manufacturing tolerances for the injectors were adjusted and an acceptance test of each individual injector head established. The launch vehicle's characteristics and performance are reviewed by listing the first payloads alloted. The three stage launch system and SYLDA (the ARIANE dual launch system) are described. The future program for ARIANE is summarized, with higher performance due to increasing the specific impulse on the third stage and adding two solid boosters to the first stage. A payload mass of twice the present system, and a larger useful volume, are envisaged, thereby increasing the range of satellites launchable by ARIANE. Author (ESA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N81-31030# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1982, VOLUME 4
Washington GPO 1981 1248 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 7, 28 Jan., 20, 23, 27 Feb., and 2, 4-5, 10-11 Mar. 1981
(GPO-79-432-Vol-4) Avail: Subcommittee on Space Science and Applications

Progress and accomplishments of the year are reviewed and requests for funding are examined in the areas of space sciences, shuttle related activities, space flight operations, a space applications, and aeronautics. The numerical aerodynamics simulation which will reduce the cost of aircraft design, chemical propulsion, large space structures, power systems, information systems, and the Venus Orbiting Imaging Radar spacecraft are discussed. Space processing, Spacelab payloads, and possible space shuttle configurations are also examined. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N81-31031*# Dayton Univ., Ohio.
TESTING OF THE PERMANENT MAGNET MATERIAL MN-AL-C FOR POTENTIAL USE IN PROPULSION MOTORS FOR ELECTRIC VEHICLES Final Report
Zouheir Abdelnour, Herbert Mildrun, and Karl Strant Mar. 1981 70 p refs
(Contracts DEN3-189; DE-AI01-77CS-51044)
(NASA-CR-165291; DOE/NASA/0189-81/1) Avail: NTIS HC A04/MF A01 CSCL 13F

The development of Mn-Al-C permanent magnets is reviewed. The general properties of the material are discussed and put into perspective relative to alnicos and ferrites. The traction motor designer's demands of a permanent magnet for potential use in electric vehicle drives are reviewed. Tests determined magnetic design data and mechanical strength properties. Easy axis hysteresis and demagnetization curves, recoil loops and other minor loop fields were measured over a temperature range from -50 to 150 C. Hysteresis loops were also measured for three orthogonal directions (the one easy and two hard axes of magnetization). Extruded rods of three different diameters were tested. The nonuniformity of properties over the cross section of the 31 mm diameter rod was studied. Mechanical compressive and bending strength at room temperature was determined on individual samples from the 31 mm rod. S.F.

N81-31032*# Mechanical Technology, Inc., Latham, N. Y. Engine Systems Div.
AUTOMOTIVE STIRLING REFERENCE ENGINE DESIGN REPORT
Jun. 1981 134 p
(Contracts DEN3-32; EC-77-A-31-10040)
(NASA-CR-165381; DOE/NASA/0032-12; MTI-81-ASE-164DR-2) Avail: NTIS HC A07/MF A01 CSCL 13F

The reference Stirling engine system is described which provides the best possible fuel economy while meeting or exceeding all other program objectives. The system was designed to meet the requirements of a 1984 Pontiac Phoenix (X-body). This design utilizes all new technology that can reasonably be expected to be developed by 1984 and that is judged to provide significant improvement, relative to development risk and cost. Topics covered include: (1) external heat system; (2) hot engine system; (3) cold engine system; (4) engine drive system; (5) power control system and auxiliaries; (6) engine instalation; (7) optimization and vehicle simulation; (8) engine materials; and (9) production cost analysis. A.R.H.

N81-31033*# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
AXIAL-FIELD PERMANENT MAGNET MOTORS FOR ELECTRIC VEHICLES Final Report, 15 Jan. 1979 - 30 Sep. 1981
Peter Campbell 30 Sep. 1981 74 p refs
(Grant NsG-3243)
(NASA-CR-164708) Avail: NTIS HC A04/MF A01 CSCL 13F

The modelling of an anisotropic alnico magnet for the purpose of field computation involves assigning a value for the material's permeability in the transverse direction. This is generally based upon the preferred direction properties, being all that are easily available. By analyzing the rotation of intrinsic magnetization due to the self demagnetizing field, it is shown that the common assumptions relating the transverse to the preferred direction are not accurate. Transverse magnetization characteristics are needed, and these are given for Alnico 5, 5-7, and 8 magnets, yielding appropriate permeability values. Author

N81-31034*# AiResearch Mfg. Co., Torrance, Calif.
ADVANCED ELECTRIC PROPULSION SYSTEM CONCEPT FOR ELECTRIC VEHICLES. ADDENDUM 1: VOLTAGE CONSIDERATIONS Final Report
A. E. Raynard and F. E. Forbes Aug. 1980 77 p refs
(Contracts DEN3-81; EC-77-A-31-1044)
(NASA-CR-165243; DOE/NASA/0081-2; AiResearch-79-16182-Add-1) Avail: NTIS HC A05/MF A01 CSCL 13F

The two electric vehicle propulsion systems that best met cost and performance goals were examined to assess the effect of battery pack voltage on system performance and cost. A voltage range of 54 to 540 V was considered for a typical battery pack capacity of 24 k W-hr. The highest battery specific energy (W-hr/kg) and the lowest cost ($/kW-hr) were obtained at the minimum voltage level. The flywheel system traction motor is a dc, mechanically commutated with shunt field control, and due to the flywheel the traction motor and the battery are not subject to extreme peaks of power demand. The basic system uses a permanent-magnet motor with electronic commutation supplied by an ac power control unit. In both systems battery

cost were the major factor in system voltage selection, and a battery pack with the minimum voltage of 54 V produced the lowest life-cycle cost. The minimum life-cycle cost for the basic system with lead-acid batteries was $0.057/km and for the flywheel system was $0.037/km. A.R.H.

N81-31035*# University of Southern California, Los Angeles. NASA Industrial Application Center.
ADVANCED TECHNOLOGY DISPLAY HOUSE. VOLUME 1: PROJECT SUMMARY AND PROCEDURES
D. H. Maund [1981] 54 p refs 4 Vol.
(Contract NAS2-10794)
(NASA-CR-166238-Vol-1; DRB-320-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 13B

The Advanced Technology Display House (ATDH) project is described. Tasks are defined in the areas of energy demand, water demand, sewage treatment, electric power, plumbing, lighting, heating, and air conditioning. Energy, water, and sewage systems are defined. S.F.

N81-31036*# University of Southern California, Los Angeles. NASA Industrial Application Center.
ADVANCED TECHNOLOGY DISPLAY HOUSE. VOLUME 2: ENERGY SYSTEM DESIGN CONCEPTS
D. H. Maund [1981] 62 p refs 4 Vol.
(Contract NAS2-10794)
(NASA-CR-166238-Vol-2; DRB-320-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 13B

The preliminary design concept for the energy systems in the Advanced Technology Display House is analyzed. Residential energy demand, energy conservation, and energy concepts are included. Photovoltaic arrays and REDOX (reduction oxidation) sizes are discussed. S.F.

N81-31037*# University of Southern California, Los Angeles. NASA Industrial Application Center.
ADVANCED TECHNOLOGY DISPLAY HOUSE. VOLUME 3: WATER AND SEWER DESIGN CONCEPTS
D. H. Maund [1981] 58 p refs 4 Vol.
(Contract NAS2-10794)
(NASA-CR-166238-Vol-3; DRB-320-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 13B

Preliminary design concepts for water and sewer systems in the Advanced Technology Display House are described. Proposals for on-site waste disposal and water systems are analyzed. S.F.

N81-31038*# University of Southern California, Los Angeles. NASA Industrial Application Center.
ADVANCED TECHNOLOGY DISPLAY HOUSE. VOLUME 4: BIBLIOGRAPHY
D. H. Maund [1981] 44 p 4 Vol.
(Contract NAS2-10794)
(NASA-CR-166238-Vol-4; DRB-320-Vol-4) Avail: NTIS HC A03/MF A01 CSCL 13B

A bibliography is presented for the Advanced Technology Display House. Information sources used in generating the design concepts studied are included. S.F.

N81-31039# California Univ., Livermore. Lawrence Livermore Lab.
DECLINE IN US PRODUCTIVITY GROWTH AND THE ROLE OF R AND D FOR INNOVATION
A. L. Austin 1 Jan. 1981 21 p refs
(Contract W-7405-eng-48)
(UCRL-53135) Avail: NTIS HC A02/MF A01

A collection of data on productivity and innovation is presented. The report avoids drawing firm conclusions on the economic state of the nation or on policy recommendations, but instead, summarizes the implications. The decline in US productivity growth is affecting our economic health. The sluggish growth of per capita disposable income relative to other countries, the declining share of world trade, and decreased technological lead are among the symptoms of concern. Productivity increase will require revitalized innovation which, in turn, generally starts with R and D. These growing concerns will affect future R and D priorities and the traditional roles that public and private sectors have played. It is clear these two sectors will have increasing opportunities to work together in a more productive fashion with a common motivation to increase the US competitive position in world trade. Therefore, the government role in energy R and D may have to give way to greater role in civil R and D for innovation. DOE

N81-31040# Argonne National Lab., Ill.
STUDY DESCRIPTION: AN ENVIRONMENTAL COMPARISON OF FUTURE URBAN-TRANSPORTATION ALTERNATIVES
D. O. Moses (DOE, Washington, D.C.) and Sarah J. LaBelle 1980 26 p refs Presented at the 3rd World Energy Congr., Atlanta, 14-16 Oct. 1980
(Contract W-31-109-eng-38)
(CONF-801076-5) Avail: NTIS HC A03/MF A01

The transportation sector directly consumes one quarter of the energy used in this country with auto passenger travel accounting for half of the transport sector's energy supply. Due to rapidly rising fuel prices and intermittent supply shortages, Federal, state, and local government have begun to introduce various strategies (combinations of policies and technologies) designed to conserve urban transportation energy while maintaining a productive economy. The environmental consequences of many of the conservation strategies have not been adequately assessed. As a result, a technology assessment project is underway. The project will concentrate on the effects of alternative conservation strategies for the efficient movement of people in urban areas. The goals of the project are to provide: a description of several alternative strategies promoting energy conservation in the urban passenger transportation sector; a better understanding of the environmental impacts of such strategies; and an identification of the constraints to the implementation of such strategies. DOE

88 SPACE SCIENCES (GENERAL)

N81-31041*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY, 1980
15 Jul. 1981 32 p Sponsored by NASA
(NASA-CR-164710; JPL-Bibl-39-22) Avail: NTIS HC A03/MF A01 CSCL 03B

This bibliography cites by primary author the externally distributed technical reporting, released during calendar year 1980, that resulted from scientific and engineering work performed, or managed, by the Jet Propulsion Laboratory. Three classes of publications are included: (1) JPL Publications (77-, 78-, 79-series, etc.), in which the information is complete for a specific accomplishment and can e tailored to wide or limited audiences and be presented in an established standard format or special format to meet unique requirements; (2) articles published in the open literature; and (3) articles from the bimonthly Deep Space Network (DSN) Progress Repot (42-series) and its successor, the Telecommunications and Data Acquisition (TDA) Progress Report (also 42-series). A.R.H.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N81-31042 Maryland Univ., College Park.
X-RAY CLUSTERS OF GALAXIES Ph.D. Thesis
John David McKee 1980 155 p
Avail: Univ. Microfilms Order No. 8117346

An introduction to clusters of galaxies is given and the HEAO A-2 survey of Abell Clusters is described. The 225 clusters of galaxies listed in Abell's (1958) catalog which are of distance class four or less, were surveyed for 2 to 10 keV X-ray emission. Thirty two identifications of X-ray sources with the clusters were made, fluxes and error boxes were determined for these

sources; twelve of the identifications are new. The X-ray luminosity function was derived and analytical fits were made. The relationship between X-ray luminosity, Bautz-Morgan type, Rood-Sastry type, and richness was also examined. The contribution of clusters to the X-ray background was calculated from the luminosity function and found to be 3.5%, and with 90% certainty, less than the 2 to 10 keV band pass, assuming that clusters were not brighter in the past than they are at present. In addition, X-ray emission from poor clusters of galaxies is also examined. Burns and Owens' (1979) sample of 24 4C radio sources which coincide with Zwicky clusters of galaxies has been searched for X-ray emission in the HEAO A-2 data base. Dissert. Abstr.

N81-31043*# California Univ., Los Angeles. Dept. of Astronomy.
OBSERVATIONS OF INTERSTELLAR ZINC Final Technical Report, 1 Jun. 1979 - 31 Aug. 1981
Michael A. Jura and D. York (Princeton Univ. Observatory) 31 Aug. 1981 23 p refs Submitted for publication
(Grant NsG-5377)
(NASA-CR-164711) Avail: NTIS HC A02/MF A01 CSCL 03A

The International Ultraviolet Explorer observations of interstellar zinc toward 10 stars are examined. It is found that zinc is at most only slightly depleted in the interstellar medium; its abundance may serve as a tracer of the true metallicity in the gas. The local interstellar medium has abundances that apparently are homogeneous to within a factor of two, when integrated over paths of about 500 pc, and this result is important for understanding the history of nucleosynthesis in the solar neighborhood. The intrinsic errors in detecting weak interstellar lines are analyzed and suggestions are made as to how this error limit may be lowered to 5 mA per target observation. M.G.

N81-31044# Astronomisches Inst., Bonn (West Germany).
THE ENVELOPE OF THE WOLF-RAYET-COMPONENT OF THE DOUBLE STAR HD 152270, NO. 92. EXPANDING ENVELOPES IN DOUBLE STAR SYSTEMS, NO. 93 [DIE HUELLE DER WOLF-RAYET-KOMPONENTE DES DOPPELSTERNS HD 152270, NR. 92 EXPANDIERENDE HUELLEN IN DOPPELSTERNSYSTEMEN, NR. 93]
W. Neutsch, H. Schmidt, and W. Seggewiss Fred Dummlers Publishing House 1979 53 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC A04/MF A01

Euler's solution of a particle's motion under the influence of two fixed centers is discussed with relation to Wolf-Rayet stars. For individual titles, see N81-31045 through N81-31046.

N81-31045# Astronomisches Inst., Bonn (West Germany).
THE ENVELOPE OF THE WOLF-RAYET-COMPONENT OF THE DOUBLE-STAR HD 152270, NO. 92 [DIE HUELLE DER WOLF-RAYET-KOMPONENTE DES DOPPELSTERNS HD 152270, NR. 92]
W. Neutsch, H. Schmidt, and W. Seggewiss *In its* The Envelope of the Wolf-Rayet-Component of the Double Star HD 152270, No. 92. Expanding Envelopes in Double Star Systems, No. 93 1979 15 p refs In GERMAN; ENGLISH summary (For primary document see N81-31044 21-89)
(Publ-92) Avail: NTIS HC A04/MF A01

The spectroscopic binary HD 152 270, which is composed of an O5 star and a Wolf-Rayet star, surrounded by an expanding envelope is discussed. A working model is developed in which an extended thin CIII shell is disturbed by the hot O star. This star causes a matter free area in the adjacent part of the envelope. The model provides an estimate of inclination-i of the orbital plane and the basic parameters of the components of the binary system by using observation data. E.A.K.

N81-31046# Astronomisches Inst., Bonn (West Germany).
EXPANDED CONTOURS IN BINARY STAR SYSTEMS, NO. 93 [EXPANDIERENDE HUELLEN IN DOPPELSTERNSYSTEMEN, NR. 93]
W. Neutsch *In its* The Envelope of Wolf-Rayet-Component of the Double Star HD152270, No. 92. Expanding Envelopes in Double Star Systems, No. 93 1979 51 p refs In GERMAN; ENGLISH summary (For primary document see N81-31044 21-89)
(Publ-93) Avail: NTIS HC A04/MF A01

A physical model for the structure of the envelope of the binary HD 15 22 70 (consisting of a main sequence star and a Wolf Rayet companion) was constructed. The equations of motion of atoms in the neighborhood of two hot stars are discussed. It is found that the limit of very high temperature of at least one of the components Euler's solution of a particle's motion under the influence of two fixed centers is quite adequate to understand the gross feature of such an envelope. Euler's work includes a determination of the density distribution. Results of a physical model which takes into account gravitation, radiation pressure, line absorption and the local variations of the radiation field due to differences in the configuration of the stars as seen from an emitting atom are given and compared with the measurements for a number of phases. E.A.K.

N81-31047# Cambridge Univ. (England). Inst. of Astronomy.
[ASTRONOMICAL AND ASTROPHYSICAL RESEARCH ACTIVITIES OF THE INSTITUTE OF ASTRONOMY] Annual Report, 1979-1980
1980 43 p refs
Avail: NTIS HC A03/MF A01

Observational work on quasars, galaxies, and stars is summarized. Theoretical studies covering stars and stellar evolution, galaxies, clusters and cosmology, high energy astrophysics the solar system and the Sun are described. Author (ESA)

N81-31048# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
DRY POLYSACCHARIDES AND THE INFRARED SPECTRUM OF OH26.5+0.6
F. Hoyle and N. Chandra Wickramasinghe May 1980 9 p refs Submitted for publication
(Preprint-59) Avail: NTIS HC A02/MF A01

A discrepancy in the observed infrared spectrum of interstellar grains is explained. The observation in the 2 to 40 micron band using the OH maser source OH 26.5+0.6 show that the absorption by grains around this source are characteristic of cellulose and in good agreement with astronomical data except over the waveband 2.9 to 3.3 microns. It is demonstrated that this discrepancy disappears if polysaccharide grains are considered to be anhydrous, as it is indeed expected to be found in many astronomical situations. Radiation from the source is supposed to propagate through a surrounding cloud of much cooler polysaccharide grains which act as Rayleigh particles in the infrared. An excellent agreement is found using dry cellulose data for a given choice of source parameters. Author (ESA)

N81-31073*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIO ASTRONOMY
P. R. Wolken, R. D. Schaffer, and M. V. Gorenstein (MIT) *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 1-9 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N81-31049 Brandeis Univ., Waltham, Mass.
THE EFFECTS OF THE INTERACTION OF A FULLY IONIZED PLASMA WITH WEAKLY MAGNETIZED PLANETARY OBSTACLES Ph.D. Thesis
Robert Sherman Wolff 1981 94 p
Avail: Univ. Microfilms Order No. 8116407

Several problems in solar system plasma physics are examined. The problems chosen deal with the dynamics of the interaction of a fully ionized plasma with planetary obstacles in the solar system. In particular, problems on the solar wind interaction with the (icy) Galilean satellites are addressed. Theoretical modelling of the effect of the variability of the solar wind dynamic pressure on the structure of the ionosphere is

compared with observations from Mariner 5,10, Venera 9,20 and Pioneer Venus. The onset and development of Kelvin-Helmholtz instability at the Venusionopause is discussed along with the generation of plasma instabilities by mass loading of the solar wind. The interaction of the Jovian magnetosphere with the icy Galilean satellites, Europe, Ganymede, and Callisto is studied. Models of atmospheres and ionospheres of the satellites are developed for a variety of possible volatiles and the effects of the interaction of the Jovian magnetosphere with both the model atmospheres and possible satellite magnetic fields are examined. The hydrodynamic modal equations are developed for the purpose of studying three dimensional planetary and stellar atmospheric dynamics. Dissert. Abstr.

N81-31050 Ohio State Univ., Columbus.
CARBON AND NITROGEN ABUNDANCES IN G AND K STARS: A PHOTOMETRIC APPROACH Ph.D. Thesis
Gunther Lothar Lange 1981 168 p
Avail: Univ. Microfilms Order No. 8115127

A system of scanner photometry at 20 A resolution is described. The scanner measurements of the molecular bands of NH, CN, CH, and C(2) are interpreted in terms of theoretical indices deduced from synthetic spectra calculations for a grid of model atmospheres of varying temperature, gravity, and metallicity. Narrow-band indices are shown to be reliable discriminants of the atmospheric C and N abundances. The effects of changes in the assumed values of the oxygen abundance, C12 to C13 ratio, and microturbulent broadening parameter upon the computed indices were investigated. Results for individual program stars are discussed. The enhancement of nitrogen in the atmospheres of evolved giants is verified. This effect represents the presence, at the surface, of the convectively mixed products of interior nucleosynthesis. Conceivable applications of the scanner program include the systematic investigation of C/Fe and N/Fe ratios in metal-poor stars. Dissert. Abstr.

N81-31051 Illinois Univ. at Urbana-Champaign.
NEUTRINO PROCESSES IN DENSE MATTER Ph.D. Thesis
Naoki Iwamoto 1981 159 p
Avail: Univ. Microfilms Order No. 8114438

The neutrino properties of quark matter by calculating the neutrino emissivities and mean free paths are investigated. It is demonstrated that the simple beta decay reactions are kinematically allowed due to quark-quark interactions, and that as a consequence quark matter has a neutrino emissivity dramatically larger than that of ordinary neutron star matter. Simple beta decay reactions due to finite quark masses, beta decay of s quarks, estimates of the emissivities from the quark modified URCA process, quark neutrino pair bremsstrahlung and color plasmon decay are considered. The possibility of detecting quark matter inside neutron stars is discussed. Neutrino mean free matter from scattering and absorption processes are calculated and compared with those of ordinary neutron star matter and matter with a pion condensate. Neutrino mean free paths from neutrinonuetron scattering in neutron matter are calculated. The correlation effects of the neutron system are taken into account in terms of Landau parameters. It is shown that the neutrinos are scattered not only by single-pair excitations (in the density and spin-density channels) but also by the collective mode of the system. Dissert. Abstr.

N81-31052 Maryland Univ., College Park.
SUBMILLIMETER WAVE SURVEY OF THE GALACTIC PLANE Ph.D. Thesis
Lim Hung Cheung 1980 224 p
Avail: Univ. Microfilms Order No. 8116460

The technical development and the results of a systematic survey of the galactic plane absolute value of B < 3 deg three submillimeter continuum wavelength bands are presented. The primary objective of the survey is to measure over virtually the entire galactic plane the distribution and basic physical conditions of the coolest dust component of the interstellar medium. The instrument, designed for observations of extended, low surface brightness continuum emission, consists of a balloon-borne, gyro-stabilized, 1.2-meter Cassegrain telescope and a liquid-helium cooled photometer with short wavelength limits of 100, 230, and 270 microns. The design, integration, tests, and flight operation of the survey observatory are presented, together with a discussion of the data analysis technique. Photometric maps of the submillimeter wave emission from the galactic plane region between l = 8 to l = 44 deg in three wavelength bands are analyzed and compared with observations at other wavelenghts. The results have contributed information both on a list of specific instellar clouds and on the distribution of mass and luminosity of a galactic scale. Dissert. Abstr.

N81-31053# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
STEADY-STATE COSMOLOGY REVISED
Fred Hoyle Jun. 1980 70 p refs Submitted for publication (Preprint-62) Avail: NTIS HC A04/MF A01

Several problems related to big bang cosmology are discussed, including helium abundance quasar distribution, and the theoretical difficulties of galaxy formation. Conversely, the criticisms of steady state cosmology are analyzed showing that the actual background radiation temperature is explained by thermalization of higher temperature energy. A white hole concept is developed as a central issue of a steady state cosmology. These white holes would be of galactic mass and would generate new galaxies in a series of smaller big bangs. An argument on life probability is also discussed, concluding that only an older universe can account for the existence of biomolecules, and that these molecules would be not confined to Earth but distributed in the universe.
Author (ESA)

N81-31054# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON THE EXPANSION OF THE METAGALAXY
B. Bonnevier Dec. 1980 12 p refs
(TRITA-EPP-80-07; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

Data concerning distant galaxies are examined to verify the hypothesis of an early extremely high density as postulated in big bang cosmology. The redshift is used to obtain the recession velocity from the formula for the relativistic Doppler effect. The distance in light years to the galaxy is obtained from the absolute magnitude. The development of the distance to each individual galaxy backwards in time is traced for a number of galaxies. A considerable spread in time development is shown. This should be compared with the usual big bang picture, where all lines should emerge from one point at an early time. The density of galaxies was higher in the past, but the conclusion that the density was extremely high is not justified. It is not possible to conclude that the density was higher than implied by the Schwarzschild limit. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N81-31055* National Aeronautics and Space Administration, Washington, D. C.
VOYAGER 2 TO MAKE CLOSEST ENCOUNTER WITH SATURN IN AUGUST
29 Jul. 1981 36 p
(NASA-News-Release-81-97; P81-10098) Avail: NASA Scientific and Technical Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The planned Voyager 2 Saturn mission is described. Information about Saturn obtained from the Voyager 1 encounter is summarized. Data on the satellites and rings of Saturn are tabulated. The video programming schedule for the Voyager 2 Saturn encounter is given. The Voyager science team is listed. J.D.H.

N81-31056*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
PHOTOMETRIC AND CCD DIRECT IMAGE OBSERVATION

OF COMET ENCKE Final Report, 19 Jun. 1980 - 1 Aug. 1981
Richard E. McCrosky Jul. 1981 8 p refs Prepared for JPL (Grant BP-724892)
(NASA-CR-164678; JPL-9950583) Avail: NTIS HC A02/MF A01 CSCL 09B

Attempted detection of periodic variations in brightness of the comet Encke is described. Viewing problems due to the position, faintness, and rate of motion of the comet are discussed. The failure of attempts to perform photoelectric photometry and CCD imaging is described. Photometric observations of the prototype Earth crosser, (1862) Apollo, are described and a photoelectric light curve of observations made during a four-hour period is presented. J.D.H.

N81-31057*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
NARROWBAND ELECTROMAGNETIC EMISSIONS FROM SATURN'S MAGNETOSPHERE
D. A. Gurnett, W. S. Kurth, and F. L. Scarf (TRW Defense and Space Systems, Redondo Beach, Calif.) 21 May 1981 30 p refs Submitted for publication Prepared for JPL
(Contracts JPL-954013; JPL-954012; Grants NGL-16-001-002; NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-164601; AD-A101686; U-OF-IOWA-81-17) Avail: NTIS HC A03/MF A01 CSCL 03/2

During the Voyager 1 flyby of Saturn a series of narrowband electromagnetic emissions were detected by the plasma wave instrument coming from the inner region of the magnetosphere in the frequency range from 3 to 30 kHz. These emissions have many close similarities to continuum radiation detected in the Earth's magnetosphere and narrowband kilometric radiation (nKOM) detected in the Jovian magnetosphere. Based on the close similarity to the terrestrial continuum radiation the Saturn narrowband emissions are interpreted as being generated by mode conversion from intense electrostatic waves at half-integral harmonics of the electron gyrofrequency. The observed frequency spacing suggests that the emissions are being generated near the moons Tethys, Dione and Rhea, probably in regions of large plasma density gradients associated with boundaries of the plasma sheet. Author (GRA)

N81-31058# Smithsonian Astrophysical Observatory, Cambridge, Mass.
CARBON AND CARBON-14 IN LUNAR SOIL 14163
E. L. Fireman and R. W. Stoenner (Brookhaven National Lab., Upton, N.Y.) 1981 19 p refs Presented at the 12th Lunar and Planetary Sci. Conf., Houston, Tex., 16 Mar. 1981
(Contract DE-AC02-76CH-00016)
(BNL-29527; CONF-810378-1) Avail: NTIS HC A02/MF A01

Carbon is removed from the surface of lunar soil 14163 size fractions by combustions at 500 and 1000 C in an oxygen stream and the carbon contents and the carbon-14 activities are measured. The carbon contents are inversely correlated with grain size. A measured carbon content of 198 ppM for bulk 14163, obtained by combining the size fraction results, is modified to 109 + or - 12 ppM by a carbon contamination correction. This value is in accord with a previous determination, 110 ppM, for bulk 14163. The small (< 53 microns) grans of 14163 had more combusted carbon-14 activity, 31.2 + or -2.5 dpm/kg, than the large grains, 11.2 + or - 2.0 dpm/kg. The combusted carbon and carbon-14 are attributed mainly to solar-wind implantation. Melt extractions of carbon-14 from the combusted soil samples gave essentially identical activities, 21.0 + or - 1.5 and 19.2 + or - 2.0 dpm/kg for the small and large grains, and are attributed to cosmic-ray spallation-produced carbon-14. DOE

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N81-31059 Maryland Univ., College Park.
ON THE ORIGIN OF MULTIPLY-IMPULSIVE EMISSION FROM SOLAR FLARES Ph.D. Thesis
Judith Tobi Karpen 1980 179 p
Avail: Univ. Microfilms Order No. 8116492

The analysis and interpretation of a set of complex X-ray bursts, selected from OSO-5 data, are presented. The multiply impulsive events were chosen on the basis of morphological characteristics: each event appears to consist of a number of overlapping spikes, with no apparent gradual component of significance. The two stage events were selected on the basis of both morphological characteristics and association with the appropriate phenomena at other wavelengths. The hard X-ray and microwve emissions are investigated with reference to associated meter wave phenomena where appropriate. The X-ray and microwave radiations are Bremsstrahlung and gyrosynchrotron, respectively, from the electrons accelerated in the relevant regions of the solar atmosphere. Together, they are used to deduce the characteristics of the source: electron density, temperaure or spectral index of the electron distribution, magnetic field strength, and area. The hard X-ray emissions alone are used to determine the parent electron spectrum and its evolution throughout an event to search for correlated variations in spectral parameters which may indicate the underlying acceleration mechanism. Dissert. Abstr.

N81-31060# Maryland Univ., College Park. Dept. of Physics and Astronomy.
MEASUREMENTS OF IONIZATION STATES FOR LOW ENERGY HEAVY IONS IN SOLAR FLARE PARTICLE EVENTS
L. S. MaSung, G. Gloeckler, and D. Hovestadt (Max-Planck-Inst. fur Extraterr. Physik, Garching, West Germany) [1981] 4 p refs
Avail: NTIS HC A02/MF A01

The ionization states of heavy ions between 0.16 - 0.24 MeV/Q in 15 flare-associated events from November 1973 to April 1980 are examined. In order to improve significantly the counting statistics and the uncertainties in background correction, data from all events are summed. The summed heavy ion data reveal the presence of both low (Q = 4,5) as well as high (Q > 16) charge states which could result from equilibrium temperatures in the source material ranging from approx. < 500,000 to approx. > 5,000,000 K. M.G.

N81-31061# Maryland Univ., College Park. Dept. of Physics and Astronomy.
EVOLUTION OF THE ENERGETIC PARTICLE COMPOSITION DURING THE NOVEMBER 1977 SOLAR FLARE EVENT AS OBSERVED BY VOYAGER 2
D. C. Hamilton and G. Gloeckler [1981] 4 p refs Sponsored in part by NASA
(SH-3.1-8) Avail: NTIS HC A02/MF A01

Measurements of the composition and energy spectra of ions near 1 MeV/nucleon during the November 1977 solar flare particle event are presented using data from the Low Energy Charged Particles experiment on Voyager 2. The O/He and Fe/He flux ratios, evaluated over equal energy/nucleon intervals, decrease monotonically from maximum values near event onset. The O/C ratio declines only slightly during the event and the He/H ratio reaches its maximum value near time of maximum intensity. The spectral indices of all species have minimum values at event onset and increase during the event, showing the effect of velocity dispersion. M.G.

N81-31062# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF CIRCUMSOLAR RADIATION ON THE ACCURACY OF PYRHELIOMETER MEASUREMENTS OF THE DIRECT SOLAR RADIATION
D. Grether, D. Evans, A. Hunt, and M. Wahlig May 1981 9 p refs Presented at the Solar Radiation Workshop of Solar Rising, the Ann. Meeting of the Am. Section of the Intern. Solar Energy Soc., Philadelphia, 26-30 May 1981
(Contract W-7405-eng-48)
(LBL-12707; CONF-810509-39) Avail: NTIS HC A02/MF A01

An effort underway to use specially developed circumsolar telescopes to measure the angular and wavelength dependence of the circumsolar radiation for application to concentrating solar energy systems is described. Data from these instruments are used to provide information on the pyrheliometer overestimate. Sample measurements of the telescopes, the range to values (overestimates) obtained over the course of a month, and the long term average effect are presented. A brief discussion is given on the relationship of the results to concentrating solar energy systems. DOE

N81-31090*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOME 20.7- AND 31.4-GHz SOLAR DISK TEMPERATURE MEASUREMENTS
M. M. Franco, S. D. Slobin, and C. T. Steizried *In its* Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 140-159 refs (For primary document see N81-31072 21-99) Avail: NTIS HC A12/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N81-31063 Illinois Univ. at Urbana-Champaign.
X AND UV RADIATION FROM ACCRETING NON-MAGNETIC DEGENERATE DWARFS: A TWO-FLUID TREATMENT OF THE EMISSION REGION AND THE EFFECTS OF STEADY NUCLEAR BURNING Ph.D. Thesis
Gordon John Weast 1981 131 p
Avail: Univ. Microfilms Order No. 8114496

The results of calculations which allow the temperatures of the electrons and the ions to differ and which include electron thermal conduction are reported. The calculation is done in spherical geometry, with cooling by bremsstrahlung and cooling by the inverse Compton effect added in the post-shock emission region. The result of steady nuclear burning of the accreted matter on the structure of the emission region is considered. The energy liberated by nuclear burning matter accreting onto degenerate dwarfs varies from 240 times the gravitational potential energy for a 0.2 solar M star to 3.7 times the for a 1.4 solar M star. Because nuclear burning occurs at a large optical depth in the envelope of the white dwarf, the energy released comes out as blackbody radiation from the stellar surface. Through the mechanism of Compton cooling, this very large blackbody flux has a controlling influence on the X-rays produced in the hot post-shock emission region just above the surface of the star. The results of calculations in which steady nuclear burning occurs at the accretion rate are reported and compared with results without nuclear burning. Dissert. Abstr.

N81-31064 Maryland Univ., College Park.
ON THE ROLE OF COSMIC RAY PROTONS IN TWO TYPES OF EXTRAGALACTIC OBJECTS Ph.D. Thesis
William Thomas Vestrand 1980 197 p
Avail: Univ. Microfilms Order No. 8117392

The role of cosmic ray protons is examined in two types of extragalactic sites: (1) clusters of galaxies, and (2) the active nuclei of quasars that produce superluminal radio components. Models of Coma-type radio halos must explain both their large extent and their rarity. A model is presented wherein secondary electrons produced by the interaction of cosmic ray protons with the observed intracluster gas are responsible for the diffuse radio emission. We find that this model predicts a correlation between a cluster's evolutionary state and the presence of Coma-type halos. This model also predicts that clusters with Coma-type halos will emit pi(0) gamma rays. The production of mesons and their secondaries in an ultrarelativistic plasma is examined. Source functions from a relativistic Maxwellian distribution of protons are numerically calculated for conditions likely during the formation of superluminal radio components. Analytic expressions for the source functions from a power law distribution of relativistic protons are also presented. Other processes likely to be important during the formation of superluminal components are discussed and the conditions under which they are likely to be important are examined. Dissert. Abstr.

N81-31065# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LATITUDINAL VARIATIONS OF THE DIFFUSE COMPONENT OF INTERMEDIATE ENERGY GAMMA RADIATION M.S. Thesis - 10 Sep. 1980 [VARIACAO LATITUDINAL DA COMPONENTE DIFUSA DA RADIACAO GAMA DE MEDIA ENERGIA]
Clovis Monteiro DoEspirito Santo Mar. 1981 129 p refs In PORTUGUESE; ENGLISH summary
(INPE-2013-TDL/047) Avail: NTIS HC A07/MF A01

A digitized spark chamber was launched aboard two balloons from Resende, Brazil in order to determine the diffuse component of gamma radiation in the 15 to 75 MeV range arriving from near the galactic center. In each of the two flights, the detector reached an altitude of 2.2 g/sq cm. Based on these data, photons/sq cm.s.sterad.MeV was obtained at energies of 21, 36, 52 and 67 MeV respectively. These values give a power law spectrum with spetral index equal to -3.3. The dependence of this radiation with the galactic latitude and longitude in the interval 355 deg < or = lambda (11) < or = 375 deg was also obtained. Results were compared with those of other experimenters. A.R.H.

N81-31066# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBSERVATION OF LOW ENERGY (0.05-3.0 MEV) GAMMA RADIATION WITH A GE-LI TELESCOPE AT THE GEOMAGNETIC LATITUDE LAMBDA = 12 DEGREES S Ph.D. Thesis - 29 Feb. 1980 [OBSERVACAO DA RADIACO GAMMA DE BAIXA ENERGIA (0,05-3,0 MEV) TELESCOPIO DE(LI) NA LATITUDE GEOMAGNETICA LAMBDA = 12 DEG S]
Jose Marques daCosta Feb. 1981 234 p refs In PORTUGUESE; ENGLISH summary
(INPE-2002-TDL/043) Avail: NTIS HC A11/MF A01

Four experiments of low energy gamma ray were flown from Guaratingueta, Brazil with a balloon-borne Ge(Li) instrument for the detection of gamma ray lines from the direction of the galactic center, the gamma ray spectra measured in these experiments, were submitted to a fine spectroscopic analysis in order to study the contribution of atmospheric and induced lines in the detector as well as in the payload. Several atmospheric and induced lines could be identified in the gamma ray spectra. The analysis of the gamma ray spectra of two of the flights showed an intensity of (4.19 + or - 1.56) x 10 to the -3 power photons/sq cm/s for the flux of the annihilation line from the direction of the galactic center. The astrophysical implications of this result are discussed. A.R.H.

N81-31067*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RAPID X-RAY VARIABILITY IN THE SEYFERT GALAXY NGC 6814 Ph.D. Thesis - Maryland Univ.
A. F. Tennant, R. F. Mushotzky, E. A. Boldt, and J. H. Swank Jun. 1981 43 p refs Submitted for publication
(NASA-TM-82143) Avail: NTIS HC A03/MF A01 CSCL 03B

The HEAO-1 A-2 high time resolution X-ray observations of the X-ray emitting Seyfert I Galaxy NGC 6814 are reported. In sharp distinction with a sample of over 30 active galactic nuclei this object showed strong X-ray variability on timescales less than 3 hours. The mean flux on a timescale of 90 minutes varied by a factor of approximately 2.5 corresponding to Delta L sub x being approximately 1 x 10 to the 43rd power ergs/sec. An autocorrelation analysis shows a characteristic time for variability of 100 (+60 or -25) seconds. There is no indication of spectral variability with an upper limit on a change in the power law spectral index of the absolute value of Delta gamma < .37, for a factor two change in intensity. The constraints of such rapid variability on a wide variety of X-ray source mechanisms are considered. M.G.

N81-31068# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DETECTION OF THE POSITRON ANNIHILATION GAMMA RAY LINE FROM THE GALACTIC CENTER REGION

F. Albernhe (Centre D'Etude Spatiale des Rayonnements, Toulouse), J. F. Leborgne (Centre D'Etude Spatiale des Rayonnements, Toulouse), G. Vedrenne (Centre D'Etude Spatiale des Rayonnements, Toulouse), D. Boclet (Centre D'Etudes Nucleaires, Saclay, France), Ph. Durouchoux (Centre D'Etudes Nucleaires, Saclay, France), and J. M. DaCosta Jul. 1981 19 p refs Submitted for publication

(INPE-2161-RPE/379) Avail: NTIS HC A02/MF A01

The results of a cosmic gamma ray line search made with a high energy resolution detector are reported. A positive detection of the 511 KeV positron annihilation line in the direction of the galactic center was made. The data is analysed assuming either a point source or an extended source. The measurements are consistent with an extended source between -30 deg and +30 deg Upper limits for other theoretically predicted lines are presented J.D.H.

N81-31069# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SEARCH ON EXTRATERRESTRIAL GAMMA-RAY LINES FROM SOUTHEN HEMISPHERE SOURCES WITH HIGH ENERGY RESOLUTION GAMMA-RAY TELESCOPES

Jose Marques daCosta, Jeronimo O. Dias Jardim, Fernando Gonzalez-Blanco, Daniel J. R. .Nordemann, Inacio M. Martin, Severino Luiz G. Dutra, Francois Albernhe (Centre d'Etude Spatiale des Rayonnements, Toulouse), Gilbert Vedrenne, Daniel Boclet (Commissariat A L'Energie Atom, Saclay, France), and Philipe Durouchoux (Commissariat A L'Energie Atomic, Saclay, France) Jul 1981 25 p refs Submitted for publication

(INPE-2171-RPE/387) Avail: NTIS HC A02/MF A01

The scope of the GEL 1 and 2 balloon-borne gamma ray telescope experiments is described. The gamma ray spectrometer to be used on GEL 1 is described. It is designed to study the nature of the Galactic center positron annihilation 511 KeV line. The telescope effect is achieved through the aperture angle formed by the gamma ray spectrometer anticoincidence crystals. The balloon gondola and onboard instrumentation of the balloon are described J.D.H.

N81-31070# Los Alamos Scientific Lab., N. Mex.

GALACTIC ORIGIN OF COSMIC RAYS, 1

Stirling A. Colgate 1981 5 p refs Presented at the 17th Intern Cosmic Ray Conf., Paris, 13-25 Jul. 1981 Submitted for publication 2 Vol.

(Contract W-7405-eng-36)

(LA-UR-81-965; CONF-810711-1) Avail: NTIS HC A02/MF A01

The theoretical basis for the supernova (SN) envelope shock origin of cosmic rays is reviewed. The theoretical explanation of the SN Type I light curve requires the ejection of a relativistic mass fraction. The criterion of the adiabatic decelleration by Alfven wave trapping neither applies in theory, when beta > 1, or practice, the Starfish high altitude nuclear explosion experiment. Arguments of delayed acceleration due to K-capture are not applicable to SN ejecta because a period of prompt recombination exists before subsequent stripping in propagation. DOE

N81-31071# Los Alamos Scientific Lab., N. Mex.

GALACTIC ORIGIN OF COSMIC RAYS, 2

Stirling A. Colgate 1981 5 p refs Presented at the 17th Intern Cosmic Ray Conf., Paris, 13-25 Jul. 1981 Submitted for publication 2 Vol.

(Contract W-7405-eng-36)

(LA-UR-81-966; CONF-810711-2) Avail: NTIS HC A02/MF A01

The cosmic ray (CR) acceleration due to shocks in the interstellar matter (ISM) depends upon multiple crossing approx. = c/3 v sub Alfven = 10,000 per e-fold energy gain. The up-stream scattering required to produce this barrier is Alfven wave turbulence. When the ratio (CR pressure)/B squared/8 pi is identical to beta > 1, the streaming velocity theoretically and observationally becomes > > v sub Alfven and, hence, no effective up-stream barrier is likely to exist. If all ISM shock acceleration is limited to beta < < 1 and the average galactic CR conditions is beta = 1, then shocks in the ISM are unlikely to supply the necessary acceleration. This is particularly so for high energy CR's accelerated early in the remnant history where beta must be large and the number of e-folds required are large. High energy CR's can be produced by the shock breaking out of the envelope into the magnetosphere of the SN star. DOE

99 GENERAL

N81-31072*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE TELECOMMUNICATIONS AND DATA ACQUISITION PROGRESS REPORT 42-64 Progress Report, May - Jun. 1981

N. A. Renzetti, ed. 15 Aug. 1981 264 p refs

(Contract NAS7-100)

(NASA-CR-164695; JPL-TDA-PR-42-64) Avail: NTIS HC A12/MF A01 CSCL 17B

Progress in the development and operations of the Deep Space Network is reported. Developments in Earth-based radio technology as applied to geodynamics, astrophysics, and the radio search for extraterrestrial intelligence are included. For individual titles, see N81-31073 through N81-31102.

N81-31073*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RADIO ASTRONOMY **c89**

P. R. Wolken, R. D. Schaffer, and M. V. Gorenstein (MIT) *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 1-9 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 03A

The activities of the Deep Space Network in support of Radio Astronomy Operations during April and May 1981 are reported. Work in progres in support of an experiment selected for use of the DSN by the Radio Astronomy Experiment Selection Panel, Twin Quasi-Stellar Object VLBI, is reported. J.M.S

N81-31074*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE SETI PROGRAM PLAN AND INSTRUMENT DEVELOPMENT STATUS **c55**

A. L. Berman and R. B. Crow *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 10-17 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 03B

The primary thrust of the SETI (Search for Extraterrestrial Intelligence) Program is to search the microwave region of the spectrum for signals of extraterrestrial intelligent origin. The SETI program plan and current SETI breadboard instrument development activities are described. J.M.S.

N81-31075*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROJECT ORION MICROWAVE SUBSYSTEM DESIGN **c32**

D. L. Gannon *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 10-17 (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

The proposed design for the microwave subsystem of Project ORION is presented. Performance characteristics and subsystem capabilities are discussed. Functional requirements and key performance parameters are stated for the subsystem as well as a proposed schedule of events. Author

N81-31076*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NARROW CHANNEL BANDWIDTH RECEIVER FOR VLBI **c32**

E. N. Sosa, T. Sato, and D. A. Tyner *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 18-29 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 17B

An introduction to the phase four receiver subsystem to be implemented into the DSN for VLBI applications is presented. The key design areas are discussed along with the design approach. Preliminary evaluation data indicate a feasible, straightforward design may be obtained. Author

N81-31077*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPING NEW ARCHITECTURES FOR THE BLOCK 2 VLBI CORRELATOR SYSTEM **c33**
J. C. Peterson *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 30-40 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09C

The overall LSI (large-scale integrated circuits) architecture design and current status of the VBLI (very long baseline interferometry) block 2 correlator is addressed. The VBLI correlator algorithms demand a computing system that provides a throughput of hundreds of millions of instructions per second to perform cross-correlation detection for six baselines. The LSI technology lights the way for the computation of complex parallel process and is raising the upper bound of computerization. J.M.S.

N81-31078*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN FREQUENCY AND TIMING SYSTEM MARK 3-81 **c70**
J. B. Curtright *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 41-52 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 17B

The DSN frequency and timing system configuration and functions are described. The text is historical in nature, ending with the current system design and performance. Author

N81-31079*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN COMMAND SYSTEM **c32**
H. C. Thorman *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 53-60 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 17B

Modification of the currently operational DSN Command System MK 3-80 consisted of improvement of the uplink carrier frequency tuning capability to satisfy Voyager 2 requirements. Upgrading of Command System monitoring functions in the Network Operations Control Center is discussed. The DSN Command System requirements and functional design are described for the Mark 4 Network. J.M.S.

N81-31080*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DSN VLBI SYSTEM MARK 4-85 **c32**
W. D. Chaney *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 61-76 ref (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 20N

The DSN VLBI System was established as a network system in 1978. The evolution of the VLBI System from Mark 1-79 to Mark 4-85 is described, and the system functional requirements for Mark 4-85 are discussed. J.M.S.

N81-31081*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT **c15**
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 77-79 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

Tracking and data acquisition for Project Voyager are discussed for the period of April through June 1981. Voyager 1 was in the extended mission phase of operations. Voyager 2 completed the cruise phase of its operations and on 5 June entered the observatory phase of the Saturn encounter operations. J.M.S.

N81-31082*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPACE SHUTTLE LAUNCH ERA SPACECRAFT INJECTION ERRORS AND DSN INITIAL ACQUISITION **c16**
A. R. Khatib, A. L. Berman, and J. A. Wackley *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 80-82 ref (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

The initial acquisition of a spacecraft by the Deep Space Network (DSN) is a critical mission event. This results from the importance of rapidly evaluating the health and trajectory of a spacecraft in the event that immediate corrective action might be required. Further, the DSN initial acquisition is always complicated by the most extreme tracking rates of the mission. The DSN initial acquisition characteristics will change considerably in the upcoming space shuttle launch era. How given injection errors at spacecraft separation from the upper stage launch vehicle (carried into orbit by the space shuttle) impact the DSN initial acquisition, and how this information can be factored into injection accuracy requirements to be levied on the Space Transportation System (STS) is addressed. The approach developed begins with the DSN initial acquisition parameters, generates a covariance matrix, and maps this covariance matrix backward to the spacecraft injection, thereby greatly simplifying the task of levying accuracy requirements on the STS, by providing such requirements in a format both familiar and convenient to STS. J.M.S.

N81-31083*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS) NAVIGATION WITH DSN RADIO METRIC DATA **c13**
J. Ellis *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 83-89 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 22A

The use of DSN radiometric data for enhancing the orbit determination capability for TDRS is examined. Results of a formal covariance analysis are presented which establish the nominal TDRS navigation performance and assess the performance improvement based on augmenting the nominal TDRS data strategy with radiometric data from DSN sites. J.M.S.

N81-31084*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TEMPERATURE STABILIZED PHASE DETECTOR **c35**
Yeeman Lo *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 90-95 (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 14B

The construction, tests, and performance of a temperature stabilized phase detector are discussed. It has a frequency stability of 5 parts in 10 to the 16th power at 100 MHz, with a temperature step of 20 C (15 to 35 C). J.M.S.

N81-31085*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF TRACKING PERFORMANCE OF THE MTDD COSTAS LOOP FOR UQPSK SIGNAL **c17**
Y. H. Park *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 96-108 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09F

The tracking performance of the breadboard Costas loop for the Multimegabit Telemetry Demodulator/Detector (MTDD) System using an unbalanced quadriphase-shift-keyed (UQPSK) signal is considered. The particular Costas loop is a biphase polarity type with passive arm filters. The loop contains a hard limiter in front of the third multiplier, which is a chopper-type device. The rms phase jitter predictions made have also been verified experimentally. J.M.S.

N81-31086*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXPERIMENTAL RESULTS ON TRACKING PERFORMANCE OF THE MTDD COSTAS LOOP WITH UQPSK SIGNAL **c17**
Y. H. Park *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 109-115 refs (For primary document see N81-31072 21-99)
Avail: NTIS HC A12/MF A01 CSCL 09F

The carrier tracking performance of the breadboard Costas Loop of the Multimegabit Telemetry Demodulator Detector System was tested with unbalanced quadriphase shift keying (UQPSK) signals. An S-band UQPSK modulator was built for the tests. The experimental results are very close to the theoretical rms phase error calculations. The test and analysis show that the rms phase error for UQPSK signals is less than 5 deg at the design point if the I-to-Q channel power ratio is larger than 6 dB. Author

N81-31087*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

BORESIGHTING TECHNIQUES FOR THE ANTENNA CONTROL ASSEMBLY (ACA) c32

K. F. Abichandani and J. E. Ohison (Stanford Telecommunications, Inc.) *In its* The Telecommun and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 116-122 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

Comparison of four scanning schemes including CONSCAN indicates that CONSCAN with signal cleanup and protection processes has the greatest merit in terms of accuracy, dependability and automatic unattended operation. Specific problem areas, error sources, and corrective measures are discussed. Author

N81-31088*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DSS 14 64-METER ANTENNA. COMPUTED RF PATH-LENGTH CHANGES UNDER GRAVITY LOADINGS c31

M. S. Katow *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 123-131 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 13B

Using a computer model of the reflector structure and its supporting assembly of the 64-m antenna rotating about the elevation axis, the radio frequency (RF) pathlengths changes resulting from gravity loadings were computed. A check on the computed values was made by comparing the computed foci offsets with actual field readings of the Z or axial focussing required for elevation angle changes. R.C.T.

N81-31089*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE 20.7- AND 31.4-GHz ATMOSPHERIC NOISE TEMPERATURE MEASUREMENTS c46

S. D Slobin, M. M. Franco, and C. T. Steizried *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 132-139 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 04A

The 20.7/31.4-GHz water vapor radiometer was used for atmospheric noise temperature mesurements. Tipping curve data and on/off Sun data are compared. During the time of the data collection (7:00 a.m. to 12:20 p.m.), the sky was clear and the ground temperature and humidity varied from 14 C to 24 C and 65 percent to 51 percent respectively. The tipping curve data is felt to be the most accurate. R.C.T.

N81-31090*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SOME 20.7- AND 31.4-GHz SOLAR DISK TEMPERATURE MEASUREMENTS c92

M. M. Franco, S. D. Slobin, and C. T. Steizried *In its* Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 140-159 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 03B

The performance of a 20.7/31.4 GHz water vapor radiometer was evaluated with respect to its use in measuring atmospheric noise temperature. Results are in good agreement with the results previously reported at the same frequency. R.C.T.

N81-31091*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

X-BAND ATMOSPHERIC NOISE TEMPERATURE STATISTICS AT GOLDSTONE, DSS 13, 1979 AND 1980, AND CLEAR AIR NOISE TEMPERATURE MODELS FOR GOLDSTONE c46

S. D. Slobin, C. T. Steizried, E. M. Andres, and M. M. Franco *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 161-167 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 04A

Superhigh frequency (X band) noise temperature data are presented which illustrate the noise temperature increase above quiescent baseline for the years 1979 and 1980. Clear air models are also given which shows the seasonal noise temperature effects of changing surface water vapor densities for a particular atmospheric model. R.C.T.

N81-31092*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ANTENNA BEAM SOLID ANGLE RELATIONSHIPS c32

T. Y. Otoshi *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 168-172 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

Some of the useful formulas and methods for determining antenna beam solid angle are presented. The applicability of these formulas in evaluating radiometric systems performance is illustrated. R.C.T.

N81-31093*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ON COUNTERS USED FOR NODE SYNCHRONIZATION c61

C. A. Greenhall *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 173-179 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 09B

A suboptimal quick look decoding algorithm for the deep space network convolutional code is discussed. Particular emphasis is given to the encoding and decoding schemes. R.C.T.

N81-31094*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DEEP-SPACE OPTICAL CHANNEL. 1: NOISE MECHANISMS c74

J. Katz *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 180-186 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20F

The noise due to various sources in the deep space optical channel with a space based receiver is analyzed. It is found that the worst case conditions occur during the encounter phase with planets. R.C.T.

N81-31095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

BURST STATISTICS OF VITERBI DECODING c32

L. J. Deutsch and R. L. Miller *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 187-193 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 17B

A mathematical model of Viterbi decoder burst error performance is presented. This model allows for computer generation of Viterbi-like error sequences quickly and inexpensively for applications where large amounts of data are required. The model is corroborated through comparisons with actual software decoder simulations. R.C.T.

N81-31096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EFFICIENT TECHNIQUE FOR THE PERFORMANCE EVALUATION OF ANTENNA ARRAYS WITH NOISY CARRIER REFERENCE c32

T. Y. Yan and L. Clare *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 194-206 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20N

An efficient computational technique is developed to evaluate the performance of coherent receivers with noisy carrier reference and multiple antennas. The received signal is assumed to be uncoded residual carrier BPSK (binary phase shift keying), with a PLL (phase locked loop) used for extracting the carrier. Explicit relationships between the error probabilities and the various system parameters are given. Specific results are given for the

performance gain of combined carrier referencing over baseband only combining when the channel alignment process is ideal. A simple asymptotic expression for the performance gain is determined when the number of antennas used is increased without bound. An example using a Block 3 Deep Space Network PLL illustrates the performance of each arraying structure. The technique used is applicable to the performance evaluation for other receivers having similar decision statistics. M.G.

N81-31097*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ANALYSIS OF CAPACITIVE HEAT EXCHANGERS, PART 1 **c34**

D. Schonfeld *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 207-221 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 20D

Governing equations are developed for a simple capacitive heat exchanger. This type of heat exchanger consists of hot spherical particles falling through an ascending cold gas stream. The assumptions made in deriving the continuity, momentum and energy equations are clearly stated. The analysis yields a system of first order, ordinary, nonlinear equations which form a complex boundary value problem. The method of solution is presented together with a comparison between the performance of capacitive heat exchangers and conventional counter flow ones. M.G.

N81-31098*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COHERENT REFERENCE GENERATOR PHASE STABILITY **c33**

V. N. Korwar *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 222-231 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 09C

Approximate phase stability estimates for the coherent reference generator (CRG) unit in the DSN's Frequency and Timing Subsystem (FTS) are calculated. The method used involves estimating the phase noise introduced by CRG components based upon measurements made in the past on similar components in other parts of the FTS and obtaining the CRG phase noise from the component phase noises. Three estimates of phase stability are calculated: the fractional frequency change for a 5 C step in temperature, the phase noise spectral density, and the Allan standard deviation. It is found from these estimates that the CRG phase stability is better than that of the H-maser physics unit + receiver. Thus, the first step in improving FTS phase stability would be to make improvements in the H-maser physics unit + receiver. These results are corroborated by indirect clock stability estimates calculated from Doppler data. M.G.

N81-31099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CURRENT STATUS OF THE HAL/S COMPILER ON THE MODCOMP CLASSIC 7870 COMPUTER **c60**

P. J. Lytle *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 232-233 (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 09B

A brief history of the HAL/S language, including the experience of other users of the language at the Jet Propulsion Laboratory is presented. The current status of the compiler, as implemented on the Modcomp 7870 Classi computer, and future applications in the Deep Space Network (DSN) are discussed. The primary applications in the DSN will be in the Mark IVA network. M.G.

N81-31100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RELOCATION OF THE NETWORK DATA PROCESSING AREA **c14**

R. P. Hurt *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 235-238 (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 22D

Rationale for relocation of the Deep Space Network data processing area is presented along with background information regarding the Network Operations Control Center. Author

N81-31101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RECYCLING USED LUBRICATING OIL AT THE DEEP SPACE STATIONS **c27**

J. L. Koh *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 239-246 refs (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 07D

A comparison is made of the lubricating oil recycling methods used in the Deep Space Station 43 test and the basic requirements which could favor recycling of oil for continuous reuse. The basic conditions for successful recycling are compared to the conditions that exist in the Deep Space Network (DSN). This comparison shows that to recycle used oil in the DSN would not only be expensive but also nonproductive. M.G.

N81-31102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPUTERIZED ENERGY ANALYSIS FOR THE MARS OPERATIONS SUPPORT BUILDING **c31**

C. S. Yung *In its* The Telecommun. and Data Acquisition Progr. Rept. 42-64 15 Aug. 1981 p 247-257 (For primary document see N81-31072 21-99)

Avail: NTIS HC A12/MF A01 CSCL 13B

A detailed computerized building load simulation of the Operations Support Building at the Mars Deep Space Station, Goldstone, California is described. Five energy conservation suggestions were investigated prior to implementation. The results showed that cost savings of about 16 percent of present energy costs are possible. M.G.

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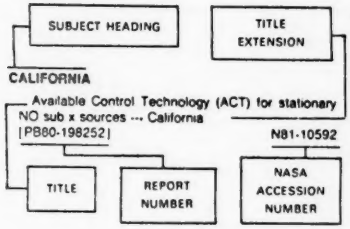

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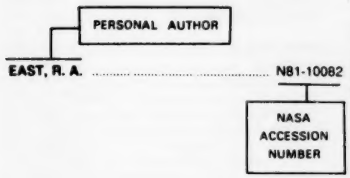

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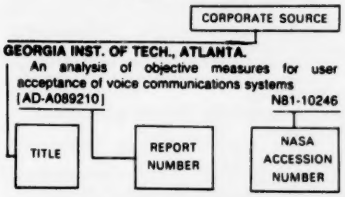

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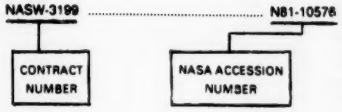

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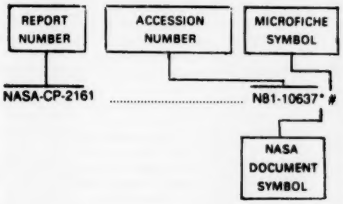

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